METEOROLOGY GROUP

DOCUMENT 351-97

A GLOSSARY OF SELECTED METEOROLOGICAL TERMS

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
ABERDEEN TEST CENTER
NATIONAL TRAINING CENTER

ATLANTIC FLEET WEAPONS TRAINING FACILITY
NAVAL AIR WARFARE CENTER WEAPONS DIVISION
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY

30TH SPACE WING
45TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR FORCE DEVELOPMENT TEST CENTER
AIR WARFARE CENTER
ARNOLD ENGINEERING DEVELOPMENT CENTER
GOLDWATER RANGE

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aberration - 1. Failure of rays to focus to a perfect image. 2. Defect causing such failure.

absolute humidity - Water vapor concentration; water vapor density; the mass of water vapor per unit volume of air.

absolute pressure - Pressure referenced to a total vacuum.

absolute temperature scale (A) - See Kelvin temperature scale.

absolute zero - The zero point of the Kelvin temperature scale, of fundamental significance in thermodynamics and statistical mechanics. It may be interpreted as the temperature at which the volume of a perfect gas vanishes, or more generally, the temperature of the cold reservoir which would render a Cannot cycle 100 percent efficient. The value of absolute zero is indicated at -273.16 ± 0.01 °C, 459.8 °F, or 0K.

absorption - 1. The process by which incident radiant energy is retained by a substance. A further process always results from absorption, that is, the irreversible conversion of the absorbed radiation into some other form of energy within and according to the nature of the absorbing medium. The absorbing medium itself may emit radiation but only after an energy conversion has occurred. 2. In general, the taking up or assimilation of one substance by another, where the two substances chemically or physically combine.

absorption coefficient - 1. A measure of the amount of normally incident radiant energy absorbed through a unit distance by a mass of absorbing medium. 2. For dissolved gases: the maximum volume of gas that can be dissolved in a unit volume of water. The absorption coefficient of gases generally decreases with increasing temperature and salinity. 3. A measure of the decrease in radiation per unit distance (volume absorption coefficient) or per unit mass (mass absorption coefficient) caused by absorption as the radiation passes through the atmosphere (or other medium).

absorption factor - See absorptivity.

absorption hygrometer - A chemical hygrometer measures the water vapor content of the atmosphere by absorbing the vapor using a hygroscopic chemical. The amount of vapor absorbed may be determined in an absolute manner, by weighing the hygroscopic material, or in a nonabsolute manner by measuring a physical property of the subwater vapor absorbed. The

lithium chloride humidity strip and carbon film hygrometer element are examples of the latter.

absorption loss - That part of the transmission loss caused by dissipation or the conversion of sound energy into some other form of energy, usually heat. This conversion may take place within the medium itself or upon a reflection at one of its boundaries.

absorptivity (or absorption factor) - A measure of the amount of radiant energy absorbed by a given substance of definite dimension; defined as the ratio of the amount of radiant energy absorbed to the total amount incident upon that substance.

acceleration - The time rate of velocity change; a vector quantity.

acceleration component - That part of a total acceleration which is effective in a specified direction such as one of the coordinate axes.

acceleration error - 1. In general, the difference at any time between the measured value of the acceleration and its specified or desired value. An analysis of these differences will yield maximum, minimum, and average root-mean-square (rms) values. 2. In transducers, the maximum difference (at room conditions and at any measured value within the specified range) between output readings taken before and during the application of a constant acceleration along specified axes.

accelerometer - A transducer which measures acceleration and gravitational forces capable of imparting acceleration.

accuracy - 1. The numerical difference between any value and the true value; applied by transference to the instrument or system producing the value; distinguished from precision. The true value must be established independently of the value characterized. 2. In instrumental, the accuracy of a measurement after the errors caused by elements external to the instrument are removed; a measure of the accuracy of the instrument proper. 3. In transducer, the ratio of the error to the full-scale output (expressed as "within plus and minus percent of full-scale output") or the ratio of the error to the output (expressed in percent). 4. In physical measurement, the closeness with which an observation of a quantity or the mean of a series of observations is considered to approach the unknown true value of the quantity.

acoustic, acoustical - These two qualifying adjectives can be confused and, in fact, are often misused. The adjective, acoustic, is used when the term which it modifies designates something which has the properties, dimensions, or

physical characteristics associated with sound waves. The adjective, acoustical, on the other hand, is used when the term being qualified does not innately contain some property, dimension, or physical characteristic which is intimately associated with sound. Thus, we speak of an acoustic impedance, but we speak of the Acoustical Society of America.

acoustic bearing - See sonic bearing.

acoustic dispersion - 1. The scattering or spreading of sound with frequency. 2. The separation of a complex sound wave into its various frequency components, usually caused by a variation with frequency of the wave velocity of the medium. The rate of change of the velocity with frequency is used as a measure of the dispersion.

acoustic impedance - For a given surface area of an acoustic medium perpendicular at every point to the direction of propagation of sinusoidal acoustic waves of given frequency, and having equal acoustic pressures and equal volume velocities per unit at every point of the surface at any instant, the acoustic impedance is the quotient obtained by dividing the phasor corresponding to the acoustic pressure by the phasor corresponding to the volume velocity.

acoustic intensity - The limit approached by the quotient obtained by dividing the power of the acoustic energy being transmitted at a given time through a given area by the magnitude of this area as the magnitude of this area approaches zero.

$$I = \frac{P^2}{\rho c}$$

where intensity, I, in root mean square pressure, P, of a plane wave, ρ, is the density, and c the sound velocity. Units are energy per square centimeter per second.

acoustic pressure - The difference at a point between the instantaneous sound pressure and the hydrostatic pressure.

acoustic scattering - The irregular reflection, refraction, or diffraction of a sound in many directions.

acoustic screen - A blanket of air bubbles that effectively entraps back-scattered sound energy.

acoustic signature - The graphic noise output characteristic of, and identified with, a specific noise source (for example, the noise output of a particular class of submarine).

acoustic sounding - See echo sounding.

acoustic velocity - See sound velocity.

acoustic wave - See sound wave.

acoustical propagation - The transmission of sound through a medium.

acoustics - The science of sound, including its production, transmission, and effects.

acquisition - The detection, recognition, and identification of a target in sufficient detail to permit the effective employment of weapons.

acquisition, aided visual - Acquisition by means of direct viewing optical devices or by means of devices that present target information to an observer on a separate display.

acquisition, direct visual - Acquisition by use of the unaided eye.

acquisition system - A system that assists an observer in one or more of the target acquisition cycle tasks.

activation - The process of making a material radioactive by bombardment with neutrons, protons, or other nuclear particles.

active front - A front or portion which produces appreciable cloudiness and usually precipitation.

active material - Fissionable material such as, plutonium, uranium enriched with isotopes 233 or 235, and any other material capable of releasing substantial quantities of atomic energy. In the military field of atomic energy, the term refers to the nuclear components of nuclear weapons exclusive of the natural uranium parts; in the field of nuclear power, it refers to the nuclear fuel in atomic reactors.

active remote sensing device - One which provides radiant (radar, laser) energy. Usually more versatile than a passive remote sensing device. Can control the output of the transmitter.

activity - The number of nuclear transformations occurring in a given quantity of material per unit time.

adiabatic - A thermodynamic process in which heat does not enter or leave the system.

adiabatic phenomena - Those phenomena which occur without a gain or loss of heat.

adiabatic process - A thermodynamic change of state of a system in which there is no transfer of heat or mass across the boundaries of the system. In an adiabatic process, compression always results in warming, while expansion results in cooling. In meteorology, the adiabatic process is often also taken to be a reversible process. For many purposes, changes of state in the free atmosphere over periods of 2 days or less, for example, are assumed to be adiabatic.

adiabatic temperature changes - The compression of a fluid without gain or loss of heat to the surroundings is work performed on the system and produces a rise or fall of temperature. Such a rise or fall of temperature occurs with changing depth.

adrift - Floating without moorings or anchor; drifting at the mercy of the sea and weather.

advection - The process of transporting an atmospheric property solely by the mass motion (velocity field) of the atmosphere. Also, the time rate of change of the value of the advected property at a given point.

advection fog - 1. A type of fog caused by the advection of moist air over a cold surface and the consequent cooling of that air to below its dew point. 2. A very common advection fog is that caused by moist air in transport over a cold body of water (sea fog). 3. Sometimes applied to steam fog.

aerodynamically rough - A surface whose irregularities are sufficiently high that the turbulent boundary reaches right down to the surface.

aerodynamically smooth - A surface whose irregularities are sufficiently small to be entirely embedded in the laminar sublayer. Thus, the smoothness of a surface will depend only on the Reynolds number.

aerodynamic roughness, smoothness - A physical boundary is aerodynamically rough when fluid is turbulent down to the boundary itself. Over such a boundary, the velocity profile and surface drag are independent of the fluid

viscosity (v) but depend on a roughness length (z(o)) which is related to the height and spacing of the roughness elements of the surface.

aerology - 1. As officially used in the United States Navy until early 1957, same as meteorology; however, this usage tended to be more administrative than scientific. 2. As a subdivision of meteorology, the study of the free atmosphere throughout its vertical extent, as distinguished from studies confined to the layer of the atmosphere adjacent to the Earth's surface.

aeronomy - A recently introduced term denoting, basically, the physics of the upper atmosphere. It is concerned with upper-atmospheric composition (that is, nature of constituents, density, and temperature) and chemical reactions.

aerosol - 1. Small particles suspended within the air. Haze, smoke, and some small fog/cloud droplets are examples of aerosols. 2. A colloidal system of dispersed phase and dispersing medium considered as an ensemble. The dispersed phase is composed of a highly variable community of solid or liquid particles, generally in the range 10^{-7} to 10^{-1} cm, while the dispersion medium is some gas, usually air.

afternoon effect - The solar heating of the surface water which causes a shallow negative temperature gradient. The net result is downward refraction of sound rays and reduction in near-surface ranges.

agonic line - The line through all points on the Earth's surface at which the magnetic declination is zero; that is, the locus of all points at which magnetic north and true north coincide. This line is a particular case of an isogonic line. The position of this line exhibits variations in time.

airborne oceanography - The use of airborne platforms such as aircraft and helicopters to study physical parameters of the ocean.

air launch area - (test range application) The air mass within visual distance of the launch aircraft in which the launching of an air-launched missile is to be attempted, which includes the sea area 10 nautical miles forward of the air area and 2 nautical miles (8 side) of the launch azimuth.

air mass - A widespread body of air, the properties of which can be identified as having been established while that air was situated over a particular region of the Earth's surface (air-mass source region), and undergoing specific modifications while in transit away from the source region. An air mass is often defined as a widespread body of air that is approximately homogeneous in its horizontal extent, particularly with reference to temperature and moisture distribution. In addition, the vertical temperature and moisture variations are approximately the same over its horizontal extent.

air pressure - The pressure exerted by air. Although this term is very general, it is best used in cases where a limited volume of air is concerned as within an enclosed space. This term should never be used to denote a directional force such as wind pressure.

airspace - Space in the air above the surface of the Earth, or a particular portion of such space, usually defined by the boundaries of an area on the surface; projected upward.

albedo - 1. A measure of the reflecting power of a surface; that fraction of the incident radiation (total or monochromatic) which is reflected by a surface. 2. The ratio of the amount of electromagnetic radiation reflected by a body to the amount incident upon it; commonly expressed as a percentage. The albedo is to be distinguished from the reflectivity, which refers to one specific wavelength (monochromatic radiation). 3. The ratio of the amount of electromagnetic radiation reflected by a body compared to the amount incident upon it. Usually, the radiation is integrated over the visible spectrum, solar spectrum, or the entire electromagnetic spectrum.

alpha particle - A particle emitted spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus having a mass of four units and an electric charge of two positive units. See radioactivity.

altimeter setting - The pressure value to which an aircraft altimeter scale is set so it will indicate the altitude above msl of an aircraft on the ground at the location for which the value was determined.

altitude - 1. The perpendicular distance from a reference line or level to an object or point in space. 2. The vertical angle between the plane of the horizon and the line to the object which is observed or defined. 3. The height above ground level or msl.

ambient - 1. Surrounding on all sides; encompassing; enveloping, as temperature or pressure; an encompassing atmosphere. 2. The environment surrounding a body but undisturbed or unaffected by it.

ambient noise - The sounds produced in the sea by marine animals, ship and industrial activity, terrestrial movements, precipitation, and other underwater or surface activity outside of the measuring platform and detection equipment itself.

ambient pressure error (transducer) - The maximum change in output, at any measured value within a specified range, when the pressure surrounding the transducer is changed from conditions to specified extremes.

ambient temperature - The temperature of the medium surrounding an object.

anchorage - 1. An area where a ship anchors or may anchor either because of suitability or designation. 2. Explosives anchorage is an area set apart for anchored ships discharging or receiving explosives. 3. Exposed anchorage is an unprotected area from such dangers as weather, sea, or ice. 4. Prohibited anchorage is a section of a harbor kept free of anchored ships. 5. Temporary anchorage is a place where ships can anchor only under favorable conditions and where ships must have power ready to get under way.

anemometer - The general name for instruments designed to measure the speed or force of the wind. Such instruments may be classified according to the means of transduction employed. The anemometers used in meteorology include rotation, pressure plate, pressure tube, bridled cup, contact, cooling power, sonic, and optical crosswind.

angel - 1. A radar echo caused by a physical phenomenon not discernible to the eye. 2. Studies indicate that a fair portion of angels are caused by strong temperature and/or moisture gradients such as might be found near the boundaries of bubbles of especially warm or moist air. Angels frequently occur in shallow layers at or near temperature inversions within the lowest few thousand feet of the atmosphere.

angle of attack - The acute angle between a reference line fixed with respect to an airframe and the direction of the airflow relative to it. See apparent angle of attack.

angle of refraction - The angle at which a refracted ray of energy leaves the interface where the refraction occurred, measured between the direction of the refracted ray and a perpendicular to the interface at the point of refraction.

angle of roll (or angle of bank, roll angle) - The angle between the lateral axis of a craft and the horizontal. It is considered positive if the port side is higher than the starboard side but may be designated starboard or port depending upon which side is lower.

angle of yaw (or yaw angle) - 1. The horizontal angular displacement of the longitudinal axis of a ship from its neutral position during a yaw. Designated right or left according to the direction of displacement of the bow. 2. The angle between a line in the direction of the relative wind and a plane through the longitudinal and vertical axes of an aircraft. Considered positive if the nose is displaced to the right.

angular momentum - 1. The moment of the linear momentum of a particle about a point. If m is the mass of the particle, V the velocity, and r the position vector from the given point O to the particle, the angular momentum M about O is given by M = rxmV. 2. The angular momentum of a particle about an axis is defined as that component along the axis of the angular momentum of the particle about any point on the axis. 3. The angular momentum of a continuous medium is given by the intregal of the product rxV over the mass of the medium. 4. In meteorology, it is conventional to deal with the angular momentum per unit volume, which is given by the product rxρV, where ρ is the density.

angular spreading - The lateral extension of ocean waves as they move out of the generating area's swell.

angular-spreading factor - In ocean wave forecasting, the ratio of the actual wave energy present at a point to that which would have been present in the absence of angular spreading.

anomalous - Not encompassed by rules governing the majority of cases; distinguished from abnormal by implying a difference of kind rather than a difference merely of degree.

anomalous dispersion - Dispersion characterized by a decrease in refractive index with an increase in frequency.

anomalous. propagation - The propagation of energy (such as sound) when it arrives at a destination via a path significantly different from the normally expected path.

anomaly - 1. In oceanography, the difference between conditions actually observed at a serial station and those that would have existed had the water been of a given arbitrary temperature and salinity. 2. A deviation from a norm. 3. In geophysics, the difference between the theoretical or computed and actual value.

anticyclone - An extensive anticyclonic circulation; a closed circulation.

anticyclonic - Having a sense of rotation about the local vertical opposite to that of the Earth's rotation; that is, clockwise in the northern hemisphere, counterclockwise in the southern hemisphere, and undefined at the equator.

antisubmarine warfare (ASW) - Operations conducted against submarines and their supporting forces and operating bases.

antisubmarine warfare environmental prediction system (ASWEPS) - An integrated system of men and machines to predict and display oceanographic parameters in support of antisubmarine warfare operations.

aperiodic motion - Any nonperiodic motion.

aphelion - The point on an elliptical orbit around the Sun which is farthest from the Sun. (The Earth's aphelion is about 94,500,000 miles from the Sun.)

apogee - The high point in an orbit or trajectory. For an orbit around the Earth, the point farthest away from the Earth. Opposite of perigee.

apparent angle of attack - The angle between a reference line fixed with respect to an airframe and the airflow in the immediate vicinity of the angle of attack transducer.

apparent pitch - An approximation of pitch obtained from measuring the angle between the longitudinal axis of the missile and some selected reference line on one film record.

apparent roll - An approximation of roll based on measurements from one film record only.

apparent yaw - An approximation of yaw obtained from measuring the angle between the longitudinal axis of the airframe and some selected line on the film record.

arithmetic mean (or mean, average) The sum of a set of individual values of any quantity divided by the number of values in the set.

array - A group of two or more devices such as hydrophones which feed into a common receiver. The purpose of thus grouping hydrophones is to increase the coverage and sensitivity of the listening unit and also to determine the bearing of a target.

aspect - The angle made by a target with the line joining it to the observation point; known as the aspect of the target.

astronomical refraction error - The difference between the observed and true angular positions of an astronomical object caused by the atmosphere. An astronomical object is one that is at an effectively infinite distance. Astronomical refraction error is numerically equal to the total bending of a ray in passing through the atmosphere to the observer. Often called, simply, astronomical refraction.

astronomical tide (or astronomic tide) - Tide influenced by the attractions of the Sun and Moon, in contrast to a meteorological tide, which is caused mainly by wind and atmospheric pressure.

astronomical triangle - The triangle on the celestial sphere formed by arcs of great circles connecting the celestial pole, the zenith, and a celestial object. The angles of the astronomical triangle are at the pole, the hour angle; at the celestial object, the parallactic angle; and at the zenith, the azimuth angle. The sides are pole to zenith, the colatitude; zenith to celestial object, the zenith distance; and celestial object to pole, the polar distance.

astronomical unit - The mean distance from the Earth to the Sun, or the length of the semimajor axis of the elliptical orbit described by the Earth around the Sun.

atmosphere - The envelope of air surrounding the Earth and bound to it by virtue of the Earth's gravitational attraction; subdivided into atmospheric shells (q.v.). Some properties of the atmosphere are

Altitude (km)	Pressure (mb)	Temperature (°C)	Concentration (particles/cc)	Composition
Sea Level	1000	-40 to +40	2.5×10^{19}	78 %N_2, 21 %O_2 ,1% A
30	10	-50	4×10^{17}	N_2, O_2, O_3, A
200	10^{-6}		10^3 10^{10}	N_2,O_2,O,NO^+,e
800	10^{-9}		10^3 10^6	O, H_3, O^+, e
6,000	10^{-12}		10^3 10^3	He, H, H^+, e
20,000	$< 10^{-12}$	10^3 to 10^5	10^2 to 0	85% H+, 15% He^{++},3

Because of convection, the composition of the atmosphere remains essentially constant in the turbosphere, except for water vapor whose concentration generally ranges between 0.1 percent and 1 percent but can very locally up to 4 percent. Above the mesophere, solar ultraviolet, and corpuscular radiation are the energy sources reacting with the major constituents shown in the above table to produce ions and electrons; a process which uses up most of the Sun's radiation at wavelengths shorter than 0.1um. What remains to reach the lower atmosphere is less energetic but able to sunder weak molecular bonds, dissociating molecular oxygen at the top of the mesophere and ozone in the lower mesophere and in the stratosphere. Solar radiation penetration below that level is at visible and near-infrared wavelengths, and very little is absorbed by the atmosphere. This energy is, however, absorbed by the Earth's surface and reradiated in the far infrared, where it is strongly

absorbed by water vapor and carbon dioxide; thus providing the major energy source for the general circulation and weather phenomena characterizing the troposphere.

atmospheric boil (or terrestrial scintillation) - Small-scale fluctuations in the atmospheric refractive structure along a line of sight associated with microturbulence and produced by passage across the line of sight of air parcels whose densities differ slightly from those of their surroundings. These discontinuities are transported by the flow of air produced by differential heating and cooling through conduction convection off the Earth's surface, but this flow of air is not a homogeneous mass motion. Effects on optical images are shimmer in the visible portion of the spectrum and phase and amplitude variations in the infrared and ultraviolet portions. Polarization also is affected.

atmospheric density - See density.

atmospheric electric field - The electric field strength of the atmosphere. In areas of fair weather, this field is positive with respect to the Earth and increases steadily with height, reaching a value of 3 x by 10^5 volts at 6 km. The potential gradient, on the other hand, is maximum near the ground, being about 130 volts per meter and decreasing to values of only a few volts per meter above 5 km. Thunderstorms provide the source of fair weather electric current with a positive current flowing out from the tops of storms and moving rapidly horizontally over the Earth until it descends to the surface as a conduction current. The frequency of thunderstorms over the world as a whole reaches a minimum at 0300 GMT and a maximum from 1400 to 1900 GMT as does the value of potential gradient. Near thunderstorms, and under clouds of vertical development, the surface electric field varies widely in magnitude and direction, usually reversing its direction immediately beneath active thunderstorms.

atmospheric pressure - 1. At a given point, the stress produced by gravitational attraction on the air molecules and exerted by the atmosphere uniformly in all directions from that point. This stress is normally visualized as a vertical column of air above the point, whose load balances a certain column of mercury. Pressure is expressed as the height (in mm or in) of the column of mercury or expressed as millibars. 2. (or barometric pressure.) The pressure exerted by the atmosphere as a consequence of gravitational force exerted upon the "column" of air lying directly above the point in question.

atmospheric scintillation effects - A diffraction pattern of randomly arranged bright and dark "blobs" that rapidly appear and disappear when a laser beam is directed onto a screen through a certain amount of intervening atmosphere. Such effects are caused by wind-transported refractive index

irregularities. The mean wind velocity can be inferred from the movement of the scintillation pattern.

atmospheric shell - A subdivision of the atmosphere (sometimes extending into near space) according to one of five division systems: 1. (a temperature distribution) This division comprises the basic description of the atmosphere, because it enables the derivation of the pressure and density profiles through the requirement of hydrostatic balance and of the chemical composition profile by means of temperature-associated energetic processes. The troposphere (region of change), 0 to 10 km, contains two-thirds of the atmosphere's mass and extends from the Earth's surface to an altitude of 10 to 20 km depending on latitude and season. It is characterized by decreasing temperature with height, appreciable vertical wind motion, appreciable water vapor content, and as a consequence, the occurrence of weather phenomena. The stratosphere, 10 to 50 km, is the region beginning at the top of the troposphere and is relatively isothermal at -55 ^{0}C in its lower regions; in its upper regions, because of ozone photodissociation, temperature increases and reaches a value near freezing at its top. The mesosphere, 50 to 85 km, is a region of continuously decreasing temperature reaching from the top of the stratosphere to a point where the atmosphere achieves its minimum temperature of -90 ^{0}C. The thermosphere is the shell extending from the top of the mesosphere to outer space with a rapidly increasing temperature up to 200 km because of absorption of far ultraviolet radiation during photoionization. The kinetic temperature reaches a nearly constant maximum value at 300 to 400 km, but the particular value reached varies with solar activity and time of day. A maximum temperature of 2000 ^{0}C is reached during a solar cycle maximum, while 5 or 6 years later during the solar cycle minimum, the thermospheric temperature has a maximum value of only 1000 ^{0}C. On any given day, the maximum temperature is reached in the afternoon, the minimum temperature at dawn; the difference amounting to 600 ^{0}C at the solar cycle maximum and 400 ^{0}C at the cycle minimum. 2. (a dynamical process distribution) The turbosphere, 0 to 100 km, is the region where convection effectively mixes atmospheric constituents. Above the turbosphere lies the diffusosphere, where diffusion is more important than turbulent mixing in distributing the constituents. The exosphere overlaps the diffusosphere. It extends from about 600 km, where particle concentration is about 10^7 cm^{-3}, to 5000 km, where the concentration is 10^2 cm^{-3}, corresponding to the average density of the interplanetary medium (compare solar plasma). The exosphere is the outer limit of the Earth's neutral atmosphere. In this region a particle traveling away from the Earth averages only one collision and pursues essentially a ballistic trajectory in the Earth's gravitational field. Particles with sufficient velocity and no electrical charge can escape from the atmosphere. 3. (a charged particle distribution) The neutrosphere, 0 to 50 km, is the shell in which the

atmospheric gases are relatively not ionized, extending from the Earth's surface to the ionosphere. The ionosphere, commencing at 50 km, is the region containing significant numbers of free electrons which, with their accompanying positive ions, form a substantially electrically neutral ionized plasma. This region is further subdivided into layers termed "D" (50 to 90 km, daytime only); "E" (90 to 140 km); and "F" (140 to 600 to 1500 km). Ions are produced in these layers by photoionization of nitric oxide (D region), molecular oxygen and nitrogen (E region), and atomic oxygen (F region). Above the F layer lies the heliosphere, which extends to between 1200 and 5000 km and contains helium ions and above that the protonosphere containing hydrogen ions. The degree of ionization in all these regions is strongly dependent on the zenith angle of the Sun, and ion-atom interchanges may occur followed by dissociative recombinations. Charged particles do not have the temperature distribution of neutral particles; the electron temperature being greater than the neutral gas temperature at all altitudes and all times of day. They also do not quickly disappear into space under the dynamic process affecting neutral particles, but are partly trapped by the Earth's magnetic field which exerts the dominant influence on the motion of any charged particles present. See magnetosphere. 4. (a composition distribution) The homosphere, 0 to 85 km, has the same vertical extent as the turbosphere and the combination of troposphere, stratosphere, and mesosphere. The shell in which, by virtue of convection, there is no great change in atmospheric composition and the mean molecular weight of the atmosphere is sensibly constant. The heterosphere is the region above 85 km, where the composition changes with an accompanying reduction in mean molecular weight. Changes are caused in the lower regions by photoionizaton and diffusion. Constituents in the heterosphere are predominantly atoms of oxygen up to 800 km, atoms of helium from there to 2500 km, and atoms of hydrogen above that height. There are also trace constituents of ions of these elements and of free electrons. See atmosphere. 5. (a physicochemical process distribution) The chemosphere, 10 to 150 km, is the region composed of 0_2^+ and NO^+ where photochemical reactions take place. The reaction rate largely determining the temperature in this region. The ozonosphere, 0 to 100 km, is the general region of the atmosphere containing ozone. The ozone layer lying roughly between 10 and 50 km shows an appreciable ozone concentration reaching a peak at 20 to 25 km, and plays an important part in the radiative balance of the atmosphere.

atmospheric window - The spectral window in which little or no radiational absorption occurs. This is generally in the 3 to 5μm or 8 to 12μm region.

atom - the smallest (or ultimate) particle of an element that still retains the characteristics of that element. Every atom consists of a positively charged

central nucleus which carries nearly all the mass of the atom, surrounded by a number of negatively charged electrons, so the whole system is electrically neutral.

atomic bomb - A bomb whose energy comes from the fission of heavy elements such as uranium and plutonium. See hydrogen bomb.

atomic number - The number of protons in the nucleus of an atom. Each chemical element has its own atomic number. Together the atomic numbers form a complete series from 1 (hydrogen) to 103 (lawrencium) in order of increasing atomic weight. There are several exceptions. See atomic weight.

atomic weight - The relative mass of an atom of a given element. As a basis of reference, the atomic weight of the common isotope of carbon (carbon 12) is taken to be exactly 12. The atomic weight of hydrogen (the lightest element) is then 1.008. Hence, the atomic weight of any element is approximately the mass of an atom of that element relative to the mass of a hydrogen atom.

attenuance - The sum of absorptance and scatterance.

attenuation - 1. In physics, any process in which the flux density, power amplitude, intensity, and illuminance of a "parallel beam" of energy decreases with increasing distance from the energy source. Attenuation is always caused by the action of the transmitting medium itself. It should not be applied to the divergence of flux caused by distance alone as described by the inverse-square law. 2. The reduction in sound or light intensity caused by the absorption and scattering of sound or light energy in air or water. 3. A lessening of the amplitude of a wave with distance from the origin. 4. The decrease of submarine motion with increasing depth. Submarine motion resulting from surface waves attenuates rapidly with depth and practically disappears at a depth equal to a surface wavelength. 5. The decrease in intensity of a signal, beam, or wave as a result of absorption of energy and of scattering out of the beam or field of view of a detector by a medium such as the atmosphere.

attenuation coefficient - 1. A measure of the space rate of diminution or attenuation of any transmitted electromagnetic radiation. This quantity may be identified in a form of Bouguer's law (or Beer's law)

$$dI = 1aI\ dX \quad \text{or} \quad I = I_0e\text{-}a^z$$

where I is the flux density at the selected point in space, I_0 is the flux density at the source, x is the distance from the source, and a is the attenuation coefficient. 2. In general, the attenuation coefficient is specified only when the attenuation is known to be caused by both absorption and scattering or when it is impossible to determine which is the cause. More common is the use of either the absorption coefficient or the scattering coefficient. 3. The

sum of the absorption coefficient and the scattering coefficient for a medium that absorbs and scatters radiation. 4. Extinction coefficient is a synonymous term, but it is used mostly in reference to visible radiation.

attenuation constant (or attenuation factor, decay constant) - A measure of the space rate of attenuation, that is, the rate of flux-density (or power) reduction as energy (visual, electromagnetic, acoustic) propagates from its source.

attenuation (or extinction) - (geophysics) the depletion of electromagnetic energy (for example, solar radiation, radio waves, and radar waves) effected by the Earth's atmosphere and its constituents.

attenuation - The decrease in amplitude or energy of an electromagnetic signal as it passes through a medium. The value is usually expressed in decibels.

augmenting factor - A factor used in the harmonic analysis of tides or tidal currents. It is a correction factor for tabulating the hourly heights or speeds used in the summation for constituents other than S which do not occur on the exact constituent hours to which they are assigned, but at times may differ by as much as a half hour.

aurora - The sporadic radiant emission from the upper atmosphere over middle and high latitudes.

autoconvective lapse rate - That temperature lapse rate which defines a state of constant atmospheric density with height. For relapse rates in excess of this rate, the density increases with height.

automatic tide gage - An instrument that automatically registers the rise and fall of the tide.

automatic weather station - A weather station where the services of an observer are not required. Most automatic weather stations are equipped with telemetry apparatus for transmitting weather information at predetermined times or by use of an interrogation system.

average depth - The average water depths based on soundings reduced to low water datum.

azimuth - 1. The length of the arc on the horizon (in degrees) intercepted between a line to a given point and an adopted reference direction, usually true north, and measured clockwise from the reference direction. Thus, azimuth is a horizontal direction expressed in degrees. 2. The horizontal angle measured clockwise positive from a reference pole as seen from above.

background - Ever present effects in physical apparatus above which phenomenon must manifest itself to be measured. Background can take various forms depending on the nature of the measurement. In electrical measurements of radioactivity and nuclear phenomena, the term usually refers to those undesired counts or currents that arise from cosmic rays, local contaminating radioactivity, insulator leakage, amplifier noise, power line, and fluctuations. In nuclear work and photographic emulsions, the term refers to developable grains unrelated to the tracks under investigation.

background noise - Noise made up of sound from a variety of sources other than the desired signal.

background radiation - 1. Radiation arising from radioactive material other than the one directly under consideration. 2. In the ocean environment when measuring fission products or radioactive tracers, the radiation (radio activity) contributed by cosmic rays and the natural radioactive constituents of seawater. 3. Nuclear (or ionizing) radiations arising from within the body and from the surroundings to which individuals are always exposed. The main sources of natural background radiation are potassium-40 in the body, potassium-40 and thorium, uranium, and their decay products (including radium) present in rocks, soil, and cosmic rays.

backing (meteorology) - 1. General international accepted usage, a change in wind direction in a counterclockwise sense (for example, south to southeast to east) in either hemisphere; the opposite of veering. 2. According to widespread usage among United States meteorologists, a change in wind direction in a counterclockwise sense in the Northern Hemisphere; the opposite of veering.

backscatter -1. The portion of the electromagnetic energy emitted from a source that is returned toward the source because of scattering by atmospheric particulates and other objects. 2. The return of a portion of electromagnetic radiation toward its source caused by scatter.

backscattering - The part of the reflected sound scattering cross section of an object. An area equal to 4π times the product of the square of a unit distance and the square of the sound pressure scattered by the object back in the direction from which the sound has come as observed at unit distance from the acoustic center of the object, divided by the square of the sound pressure of the plane wave incident on the object. The unit of the cross section is the square of the unit distance.

backwards scatterance - The ratio of the radiant flux scattered through angles 90 to 180° from a beam to the incident flux.

ballistic flight - A missile flight in which the flight path is determined by the launch angles, missile velocity, the forces of gravity, and aerodynamic drag.

balloon - 1. A lighter-than-air aircraft that is not engine driven. May be fabricated from extensible or nonextensible film or fabric. 2. (free) - A balloon whose ascent and descent may be controlled by use of ballast or by a gas valve in the envelope but whose direction of flight is determined by the wind. 3. (moored) - A balloon that is attached to the ground by a rope or cable. Ascent or descent is controlled from the ground by adjusting the length of the attached rope or cable. (Also referred to as "tethered."). 4. (sounding) - A free, unmanned balloon instrumented and/or observed for the purpose of obtaining a sounding of the atmosphere.

baroclinity - The state of stratification in a fluid in which surfaces of constant pressure (isobaric) intersect surfaces of constant density (isosteric). The number, per unit area, of isobaric-isosteric solenoids intersecting a given surface is a measure of the baroclinity.

barometer - An instrument for measuring atmospheric pressure. There are two types of barometers which are commonly used in meteorology, the mercury barometer and the aneroid barometer.

baroswitch - A pressure-operated switching device used in a radiosonde; barometric switch. In operation, the expansion of an aneroid capsule causes an electrical contact to scan a radiosonde commutator composed of conductors separated by insulators. Each switching operation corresponds to a particular pressure level. The contact of an insulator or a conductor determines whether temperature, humidity, or reference signals will be transmitted.

base - 1. The radix of a number system. 2. The support of a photographic emulsion.

base line - 1. (electronic trajectory) - The straight line of known orientation combining two or more accurately spaced antennas or antenna fields in a trajectory measuring system. 2. (meteorology) - The reference line in a measurement by triangulation. In meteorological observations, it has several applications. For example, the horizontal distance from the observation point to the location of a ceiling-light projector; the horizontal distance between a ceilometer projector and detector; and the bearing, distance, and slope of the line between the observational points in a double-theodolite observation.

bathy - An indicator group in the coded bathythermograph message.

bathymeter - An instrument primarily designed for measuring water depth. Bathymetric surveys, previously done by lead line, are now performed by using an echo sounder and a precision depth recorder.

bathymetric - Of or pertaining to bathymetry.

bathymetric chart - A map delineating the form of the bottom of a body of water, usually by means of depth contours (isobaths).

bathymetry - The science of measuring ocean depths to determine sea floor topography.

bathythermogram - The record made by a bathythermograph, or a photographic print of this record and accompanying meteorological observations. Now rarely used.

bathythermograph (BT) - A device for obtaining a record of temperature against depth (strictly speaking, pressure) in the ocean from a ship underway. For a thermal element it has a xylene-filled copper coil which actuates a stylus through a Bourdon tube. The pressure element is a copper aneroid capsule which moves a coated glass at a right angle to the motion of the stylus. A double analog record is thus obtained as the BT is lowered and recovered.

bathythermograph (BT) winch - A small electric winch used for lowering and raising a bathythermograph. This winch is a high-speed type holding about 2,500 feet of 3/32-inch diameter stainless steel wire.

beam wind - A nautical term for a crosswind, especially a wind blowing 90° from a ship's heading.

bearing - The horizontal direction of one terrestrial point from another. Usually measured from 0.00^0 at the reference direction clockwise through 360°.

beat - The periodic variation that results from the superposition of two simple harmonic oscillations whose frequencies differ by a small amount. Involves a periodic increase and decrease of amplitude at the beat frequency which is equal to the difference in the frequencies of the two parent signals. Thus, if two pure tones having frequencies of 300 and 400 cycles per second are heard, the listener will also sense a frequency equal to the difference, 100 cycles per second. This is the beat frequency.

bel - A dimensionless unit for expressing the ratio of two values of power, the number of bels being the logarithm to the base 10 of the power ratio. With P_1 and P_2 designating two amounts of power and N the number of bels corresponding to the ratio P_1/P_2, $N = \log_{10}(P_1P_2)$.

benthic (or benthonic.) - 1. The portion of the marine environment inhabited by marine organisms which live permanently in or on the ocean bottom. 2. Pertaining to all submarine bottom terrain regardless of water depth.

beta particle - A charged particle of very small mass emitted spontaneously from the nuclei of certain radioactive elements. Most, if not all, direct fission products emit (negative) beta particles. Physically, the beta particle is identical to an electron moving at high velocity. See electron, fission products, radioactivity.

bilateral transducer (or reversible transducer) - A transducer capable of transmission in either direction between its terminations.

biographical oceanography - The study of the ocean's plant and animal life in relation to the marine environment. Includes the effects of habitat, sedimentation, physical and chemical changes in the environment, and other factors bearing on the spatial and temporal distribution of marine organisms as well as the action of organisms on the environment.

biological half-life - The time required for the amount of a specified element which has entered the body (or a particular organ) to be decreased to half of its initial value as a result of natural, biological elimination processes. See half-life.

biosphere - The transition zone between Earth and atmosphere within which most forms of terrestrial life are commonly found; the outer portion of the geosphere and inner or lower portion of the atmosphere.

bivane - A bi-directional wind vane; a sensitive wind vane used in turbulence studies to obtain a record of the horizontal and vertical components of the wind. Consists of two lightweight airfoil sections mounted orthogonally on the end of a counterbalanced rod which is free to rotate in the horizontal and vertical planes. The positions of the rod may be recorded by electrical techniques.

blackbody - A hypothetical "body" which absorbs all of the electromagnetic radiation striking it; that is, one which neither reflects nor transmits any of the incident radiation.

blackbody radiation - The electromagnetic radiation emitted by an ideal blackbody. The theoretical maximum amount of radiant energy of all wavelengths which can be emitted by a body at a given temperature.

blocking (meteorology) - Obstructing, on a large scale, the normal west-to-east progress of migratory cyclones and anticyclones. A blocking situation is attended by pronounced meridional flow in the upper levels, often comprising one or more closed anticyclonic circulations at high latitudes and cyclonic circulations at low latitudes (cutoff highs and cutoff lows). This anomalous circulation pattern (the block) typically remains nearly stationary or moves slowly westward, and persists for a week or more.

body burden - The amount of radioactive material present in the body of man or animals.

bone seeker - A radioisotope that tends to lodge in the bones when it is introduced into the body. Example: strontium-90 which behaves chemically like calcium.

bolometer - An instrument for measuring thermal radiation.

bottom - Any ground covered by water. Bed refers more specifically to the whole submerged basin, and floor is essentially the horizontal surface of the ground beneath the water.

bottom pressure - The pressure at a point on the bottom of a body of water caused by the weight of the column of water above it.

bottom pressure fluctuation - The change in pressure at a point on the bottom of a body of water as a surface wave passes over it.

bottom reflection - The return of transmitted sound from the bottom of the ocean. The characteristics of reflected sound depend on the nature of the bottom and on the wavelength of the sound.

bottom resistivity - The resistance (in ohms) between opposite faces of a unit cube of sediment. Governed more by the electrolyte concentration of the liquid filling the interstices than by the intrusive conductivity of the sediment grains themselves.

bottom reverberation - See reverberation.

bottom sample - A portion of the material forming the sea bottom that is brought up for inspection.

bottom sampler - Any instrument used to obtain a bottom sample.

bottom sediments - *(*Also called bottom materials.*)* In general, all sedimentary material regardless of origin found on or in the submarine bottom, including ballast or other material dumped into the sea by man. More specifically, limited to unconsolidated mineral and organic material forming the sea bottom, not including coral reefs or bedrock.

bottom temperature - The temperature observed at the bottom of the sea.

bottom water - The water mass at the deepest part of the water column. The densest water that is permitted to occupy that position by the regional topography. See water mass.

boundary layer - That layer of a fluid adjacent to a physical boundary in which the fluid motion is much affected by the boundary and has a mean velocity less than the free-stream value.

breaker - A wave breaking on the shore, over a reef, and so forth. Breakers may be roughly classified into three kinds, although the categories may overlap:
1. Spilling breakers break gradually over a considerable distance.
2. Plunging breakers tend to curl over and break with a crash. 3. Surging breakers peak up but instead of spilling or plunging, surge up on the beach face.

brightness - Same as luminance.

brightness, photometric - Same as luminance.

broken water - Water having a surface covered with ripples of eddies that are usually surrounded by calm water.

buoy - A float; especially a floating object moored to the bottom to mark a channel, anchor, shoal, rock, and so forth. Some common types are 1. A nun or nut buoy is conical in shape. 2. A can buoy is squat and cylindrical or nearly cylindrical above water and conical below water. 3. A spar buoy is a vertical, slender spar anchored at one end. 4 A bell buoy is one having a bell operated mechanically or by the action of waves; usually employed to mark shoals or rocks. 5 A whistling buoy is operated by wave action and used for marking shoals or channel entrances. 6. A dan buoy carries a pole with a flag or light on it.

buoyance - 1. The property of an object that enables it to float on the surface of a liquid, or ascend through and remain freely suspended in a compressible fluid

fluid such as, the atmosphere. Expressed quantitatively as the ratio of the specific weight of the fluid to the specific weight of the object or by the weight of the fluid displaced minus the weight of the object. 2. (or buoyant force; also called buoyant force) The upward force exerted upon a parcel of fluid (or an object with the fluid) in a gravitational field by virtue of the density difference between the parcel (or object) and that of the surrounding fluid.

calibration - Comparison between two instruments or devices; one of which is a standard of known accuracy of the instrument being compared.

calibration correction - The value to be added to or subtracted from the reading of an instrument to obtain the correct reaction.

calibration error - (or scale error) The error in an instrument caused by imperfection of calibration or maladjustment of its parts.

calm - 1. (meteorology) - The absence of apparent motion of the air. In the Abeaufort wind scale, this condition is reported when smoke is observed to rise vertically, or the surface of the sea is smooth and mirrorlike. In United States weather-observing practice, the wind is reported as calm if it is determined to have a speed of less than 1-mile per hour (or 1 knot). 2. (oceanographic) - The state or condition of the water surface when there are no wind waves or swell. 3. The apparent absence of motion of the surface water; the water is generally considered calm if the current speed is less than 0.1 knot. See slack water.

candle - A unit of luminous intensity of a light source.

candela - A unit of luminous intensity of a light source (SI units).

Cartesian coordinates - A system of coordinates in which the x, y, z axes are mutually at right angles (rectangular system).

cathode ray tube - A vacuum tube consisting essentially of an electron gun producing a concentrated electron beam (or cathode ray) which impinges on a phosphorescent coating on the back of a viewing face (or screen). The excitation of the phosphor produces light, the intensity of which is controlled by regulating the flow of electrons. Deflection of the beam is achieved either by voltages or internal deflection plates.

ceiling - The height above the Earth's surface of the lowest layer of clouds or obscuring phenomena aloft that together with all lower clouds or obscuring phenomena covers more than half the sky from the point or area being observed and is not classified as a thin layer.

ceilometer - An automatic, recording, cloud-height indicator comprised of three components. In the fixed-beam ceilometer, there is the projector which vertically directs an intense, modulated beam of light; the detector, the

photo-electric cell pickup, located at a known distance from the projector which scans continuously in a vertical plane to detect the illuminated spot on the cloud; and the recorder which contains an amplifier tuned to the frequency of the muldated beam so as to discriminate against extraneous light. In the rotating-beam ceilometer, the projector rotates rapidly through 360° while the detector is fixed vertically. The instrument works well day or night.

celestial sphere - A sphere of indefinitely large (infinite) radius, described around an assumed center, and upon which positions of celestial bodies are projected along radii passing through the bodies. For observations on bodies within the limits of the solar system, the assumed center is the center of the Earth. For bodies where the parallax is negligible, the assumed center may be the point of observation.

Celsius temperature scale (C) - Same as centigrade temperature scale, by recent convention. The Ninth General Conference on Weights and Measures (1948) replaced the designation degree centigrade with degree Celsius. Originally, Celsius took the boiling point of water as 100° and the ice point as 0°.

centerline - A term used rather loosely as a synonym for hotline.

centigrade temperature scale - See Celsius temperature scale.

chain reaction - 1. A reaction that stimulates its own repetition. In a fission chain reaction, a fissionable nucleus absorbs a neutron and fissions, releasing more than one additional neutron. These, in turn, can be absorbed by other fissionable nuclei, releasing more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released in a given time interval equals or exceeds the number of neutrons absorbed. 2. Any chemical or nuclear process in which some of the products of the process or energy released by the process are instrumental in the continuation or magnification of the process.

channel - 1. A natural or artificial waterway which either periodically or continuously contains moving water or which forms a connecting link between two bodies of water. 2. The part of a body of water deep enough to be used for navigation through an area otherwise too shallow for navigation. A large strait like the English Channel. 4. The deepest portion of a stream, bay, or strait through which the main volume or current of water flows. 5. A lead in pack ice. 6. An energy band of predetermined size used in the discrimination and storage of electronic pulses like those from a gamma ray spectrometer probe.

channel wave - Any elastic wave propagated in a sound channel because of a low velocity layer in the solid earth, the ocean, or the atmosphere.

character of the bottom (or nature of the bottom) - The type of material the bottom is composed of and its physical characteristics such as hard, sticky, and rough.

charted depth - The vertical distance from the tidal datum to the bottom.

chemical oceanography - The study of the chemical composition of the dissolved solids and gases, material in suspension, and acidity of ocean waters and their variability both geographically and temporally in relationship to the adjoining domains, namely, the atmosphere and the ocean bottom.

chemiluminescence - The production of light during a chemical reaction at low temperatures. Bioluminescence is a chemiluminescent reaction.

chi-square test - A statistical significance test based on frequency of occurrence; applicable both to qualitative attributes and quantitative variables. Among its many uses, the most common are tests of hypothesized probabilities or probability distributions (goodness-of-fit statistical dependence or independence association and common population homogeneity).

chop (or wind chop) - The short-crested waves that may spring up quickly in a fairly moderate breeze and break easily at the crest.

chopping sea - See choppy sea.

choppy sea (or chopping sea, cockling sea) - Short, rough waves tumbling with a short and quick motion.

circulation - 1. The flow or motion of a fluid in or through a given area or volume. 2. A general term describing water current flow within a large area; usually a closed circular pattern such as in the North Atlantic and Mediterrane.

classification of marine environments - The components of this classification commonly are used with or without the terms division, region, province, or zone.

clean weapon - One in which measures have been taken to reduce the amount of residual radioactivity relative to a "normal" weapon of the same energy yield.

clear (meteorology) - After United States weather observing practice, the state of the sky when it is cloudless or when the sky cover is less that 0.1 (to the nearest tenth).

clear-air turbulence - In aviation terminology, turbulence encountered by aircraft when flying through air space devoid of clouds. Thermals and wind shear are the main causes of clear-air turbulence. Recent studies have shown correlation between the position of the jet stream and reported occurrences of high-altitude clear-air turbulence.

clear line of sight (CLOS) - That atmospheric condition in which a cloud-free line of sight exists between a sensor and target, and the atmospheric attenuation of contrast (either visual or thermal) is not sufficient to reduce the apparent target and background contrast at the sensor location below a specified threshold level. The lock-on range defines the outer boundary of the clear line of sight.

clear-line-of-sight (CLOS) probability - The probability that a clear line of sight exists between a sensor and target within the lock-on range under a given set of atmospheric conditions. The probability aspect of this parameter derives from the probability of a cloud-free line of sight under the specified cloud condition.

clear to launch - (missile flight safety) A verbal approval which must be given by the range safety officer before any missile can be launched. Normally given within 3 minutes of launch time.

clearance closing (ballistic camera) - The position of the capping shutter blades where the lens rays clear the blades.

clearance opening (ballistic camera) - The diameter of the shutter opening where the marginal lens rays clear the blades of a capping shutter.

climate - The prevalent or characteristic meteorological conditions of a place or region, in contrast with weather which is the state of the atmosphere at any time.

clinometer - A hand instrument consisting of a tube with crosshair and a vertical circle and attached spirit level so mounted that the inclination of the line of sight can be read on the circle by centering the level bubble at the instant of observation.

close air support - Air attacks against hostile targets that are in close proximity to friendly forces and require detailed integration of each air mission with the fire and movement of those forces.

cloud - A hydrometeor consisting of a visible aggregate of minute water and/or ice particles in the atmosphere above the Earth's surface. Cloud differs from fog only in that the latter is, by definition, in contact with the Earth's surface.

cloud ceiling - The height ascribed to the lowest layer of clouds or obscuring phenomena when it is reported as broken, overcast, or obscured and not classified "thin" or "partial."

cloud cover - The portion (usually described in tenths or eighths) of the celestial dome which is obscured by cloud; described by the terms clear (0/10), scattered (1/10 to 5/10), broken (6/10 to 9/10), and overcast (10/10).

cloud-free field of view (CFFOV) - Cloud-free line of sight applied to all possible lines of sight present within the field of view of a sensor and/or its display.

cloud-free line of sight (CFLOS) - The absence of clouds on the line of sight between two points, in this context, between a target and sensor.

cloud-free line-of-sight (CFLOS) probability - The probability that a cloud-free line of sight exists between two points with a given set of cloud conditions. Estimate of this static probability assumes a random distribution of cloud elements. Dynamic cloud-free line-of-sight probability is that a cloud-free line of sight will exist under a given cloud condition for a specified time interval between two points either or both of which may be moving.

cloud passage dose - The external gamma radiation dose accumulated by a receptor during the period of radioactive cloud passage only.

cloud rise - The altitude above ground level to which vented radioactivity would rise.

cloud type - A cloud classification determined by use of one of three methods: (1) by general and species (for example, cirrus fibratus and cumulus congestus); (2) by altitude (for example, high (6 km and above), middle (2-6 km), and low (30 m-2 km); and (3) by particulate composition (for example, water clouds, ice-crystal clouds, and mixed clouds.

clutter - Natural or artificial objects other than the target which tend to hinder target detection.

coast - The general region of indefinite width that extends from the sea inland to the first major change in terrain features.

coastal area - The land and sea area bordering the shoreline.

coastal plain - A plain which borders the sea coast and extends from the sea to the nearest elevated land.

coastal current - A relatively uniform drift usually flowing parallel to the shore in the deeper water adjacent to the surf zone. The current may be related to tides, winds, or distribution of mass. Sometimes called a nearshore current or offshore current.

coastline - The configuration made by the meeting of land and the sea.

coherence - Used almost universal in meteorology, a term for the tendency for measurements which are close together in space and time to be more alike than other similar but more widely separated measurements.

collimated - Straight line, parallel beams of radiation.

condensation - The physical process by which a vapor becomes a liquid or solid; the opposite of evaporation. In meteorological usage, this term is applied only to the transformation from vapor to liquid. Any process in which a solid forms directly from its vapor is termed sublimation as is the reverse process. In meteorology, condensation is considered almost exclusively with reference to water vapor which changes to dew, fog, or clouds. Condensation in the atmosphere is brought about by either of two processes; cooling of air to its dew point or the addition of enough water vapor to bring the mixture to the point of saturation (when the relative humidity is raised to 100 percent). In either of these processes, condensation ensues only when condensation nuclei or other surfaces are present. The spontaneous formation of liquid or solid droplets from vapor (spontaneous nucleation) is opposed by the surface-free energy (latent heat) increase which attends the creation of new surfaces of the liquid or solid phase. Only for extreme supersaturation does this free energy balance swing in favor of spontaneous nucleation.

condensation trail - A cloud-like streamer which frequently forms behind aircraft or missiles flying in clear cold humid air; a contrail, a vapor trail.

conduction (of heat) - The process of heat transfer through matter by molecular impact from regions of high temperature to regions of low temperature without transfer of the matter itself.

confused sea - A rough sea where the direction and period of the sea and/or swell is indeterminate; caused by various overriding wave trains.

constant-height surface - In meteorology, a surface of constant geometric or geopotential altitude measured with respect to mean sea level; constant-level surface, isohypsic surface.

constant-pressure surface - In meteorology, a surface along which the atmospheric pressure everywhere is equal at a given instant; an isobaric surface.

constituent (or harmonic constituent, astronomical tidal constituent, component, tidal constituent, partial tide) - One of the harmonic elements in a mathematical expression for the tide-producing force and in corresponding formulas for the tide or tidal current. Each constituent represents a periodic change or variation in the relative positions of the Earth, Moon, and Sun.

constituent hour - One twenty-fourth part of a constituent day.

constituent of seawater (or chemistry of seawater) - Seawater obeying the Law of Constancy of Relative Proportions contains the following constituents:

A. Major Constituents

Chlorine	18.980 g/kg(%)
Sodium	10.561
Magnesium	1.272
Sulfur	0.884
Calcium	0.40
Potassium	0.380
Bromine	0.065
Carbon	0.028
Strontium	0.013
Boron	0.005

B. Minor Constituents

Silicon	4×10^{-6} to 2×10^{-9}
Fluorine	1.4×10^{-9}
Nitrogen	7×10^{-7} to 6×10^{-9}
Aluminum	5×10^{-7}
Rubidium	2×10^{-7}
Lithium	1×10^{-7}
Phosphorus	1×10^{-7} to 1×10^{-9}
Barium	5×10^{-8}
Iodine	5×10^{-8}
Arsenic	2×10^{-8} to 2×10^{-9}
Manganese	1×10^{-8} to 2×10^{-9}
Copper	1×10^{-8}
Zinc	5×10^{-9}
Lead	4×10^{-9}
Selenium	4×10^{-9}

Cesium	2×10^{-9}
Uranium	1.5×10^{-9}
Molybdenum	5×10^{-10}
Thorium	5×10^{-10}
Cerium	4×10^{-10}
Silver	3×10^{-10}
Vanadium	3×10^{-10}
Lanthanum	3×10^{-10}
Yttrium	3×10^{-10}
Nickel	1×10^{-10}
Scandium	4×10^{-11}
Mercury	3×10^{-11}
Gold	6×10^{-12}
Radium	3×10^{-16} to 2×10^{-17}
Cadmium	Trace
Cobalt	Trace
Tin	Trace

contained underground burst - An underground detonation at such a depth that none of the radioactive residues escape through the surface of the ground.

contamination - The presence of unwanted radioactive matter; the "soiling" of objects or materials with "radioactive dirt."

contour interval - In mapping, the difference in elevation of two adjacent contours.

contrast - 1. In general, the degree of differentiation between different tones. Where the degree is slight, the image is said to be flat. The contrast may be expressed numerically as the $\log_{10}$ of the ratio of the opacities of the lightest and densest parts or as the difference in their densities. 2. In optics, the ratio of the target reflectance (B_t) minus background reflectance (Bb) to the background reflectance, that is, $\frac{B_t - B_b}{B}$ expressed as percentage.

contrast aerial - Defined as the ratio of the reflected visible radiation from the target to the reflected visible radiation from the background (B_t/B_b).

contrast apparent - For a given slant range, the difference between the luminance (or radiance or reflectance) of a target and the luminance (or radiance or reflectance) of the background, divided by the luminance (or radiance or reflectance) of the background including the effects of atmospheric attenuation. Defined as $(B_t - B_b)/B_b$ where B_t and B_b are the reflected visible radiation (luminance or brightness) from the target and background.

contrast, brightness - See apparent contrast.

contrast, inherent - For luminance (or radiance or reflectance) measurements taken close to the target (to avoid the effects of the atmosphere), the difference between the luminance (or radiance or reflectance) of a target and the luminance (or radiance or reflectance) of its background, divided by the background luminance (or radiance or reflectance).

contrast, modulation - Defined as $(B_t - B_b)/(B_t + B_b)$ where B_t and B_b are the reflected visible radiation from the target and background.

contrast threshold - The minimum target-to-background contrast at which a sensor can operate successfully.

contrast transmission - The rarity of the apparent target-to-background contrast to the inherent target-to-background contrast.

controlled airspace - Airspace designated as continental control area, control area, control zone, or transition area within which some or all aircraft may be subject to air traffic control.

convention - A mode of heat transfer within a fluid, involving the movement of substantial volumes of the substance concerned.

convergence (or front) - 1. A situation whereby waters of different origins come together at a point or, more commonly, along a line known as a convergence line. Along such a line, the denser water from one side sinks under the lighter water from the other side. The recognized convergence lines in the oceans are the polar, subtropical, tropical, and equatorial convergence lines. Regions of convergence are also referred to as convergence zones. 2. In refraction phenomena, the decreasing of the distance between orthogonals in the direction of wave travel. Denotes an area of increasing wave height and energy concentration.

convergence zone - 1. See convergence (definition 1). 2. The region in the deep ocean where sound rays, refracted from the depths, arrive at the surface in successive intervals of 30 to 35 nautical miles. The repeated occurrence of these zones to several hundred miles from the sound source depends on the refraction of sound rays at depth and the reflection of these rays at the surface.

coordinates - 1. Linear or angular quantities, or both, which designate the position of a point in relation to a given reference frame. In surveying, there are two general divisions of coordinates: polar and rectangular. These may each be subdivided into three classes: plane coordinates, spherical

coordinates, and space coordinates. 2. (astronomic) - Quantities which define the position of a point on the geoid with reference to the planes of the celestial equator and of a selected celestial meridian. 3. (Cartesian) - See coordinates, rectangular space. 4. (geocentric (terrestrial)) - Quantities defining the position of a point on the Earth by means of the angles made by a line from the center of the Earth to the point with the planes of the celestial equator and of a selected initial geodetic latitude. 5. (geodetic) - Quantities which define the horizontal position of a point on the spheroid of reference with respect to the planes of the geodetic equator and of a selected geodetic meridian. 6. (geographic) - An inclusive term used to designate both geodetic and astronomic coordinates. 7. (grid) - Two distances which fix the position of a point on a grid: the perpendicular distance to the point from the axis of Y, termed the abscissa of x coordinate; and the perpendicular distance from the axis of X, termed the ordinate of y coordinate. In surveying operations, the nominal origin at the intersection of the axis is usually given large numerical coordinates, so the inconvenience of using negative coordinates will be avoided. Geodetic coordinates (latitudes and longitudes) may be transformed into grid coordinates, and all survey computations relating to them made by the methods and formulas of plane surveying. 8. (origin of) - A point in a system of coordinates which serves as an initial point in computing its elements or in prescribing its use. The term, origin of coordinates, has several definitions, each so well established in use that a single definition cannot be prescribed to the exclusion of the others. The following are given in the order of preferred use, but to avoid misunderstanding, the use should be defined by stating the position of the origin in the system and giving the numerical coordinates assigned to it. (a) The point of intersection of the coordinate axes from which the coordinates are reckoned. In mathematical treatises, this origin is usually given the ordinates (0,0); in surveying work, it is standard practice to give this origin coordinates having large positive numerical values, thereby, avoiding the use of negative coordinates. (b) The point to which the recoordinates values (0,0) are assigned, irrespective of its position with reference to the axes. (c) The point from which the computation of the elements of the coordinate system (projection) proceeds. 9. (plane-rectangular) - The perpendicular distances (coordinates) of a point from a pair of axes which intersect at right angles, reckoned in the plane defined by those axes. Plane-rectangular coordinates are usually calculated from data which are in the form of polar coordinates, that is, the distance and direction (bearing and azimuth) from a previously determined point. For example, the computation of latitudes and departures in land surveying. The methods used are based on plane trigonometry and geometry. The position of a point on the Earth may be defined by plane-rectangular coordinates on a tangent plane (local system of plane coordinates), or on so-called conic or cylindrical map projections like those used in the state plane-coordinate system. 10. (polar (general)) - The distance and direction from a central point of reference to a point whose

contrast, brightness - See apparent contrast.

contrast, inherent - For luminance (or radiance or reflectance) measurements taken close to the target (to avoid the effects of the atmosphere), the difference between the luminance (or radiance or reflectance) of a target and the luminance (or radiance or reflectance) of its background, divided by the background luminance (or radiance or reflectance).

contrast, modulation - Defined as $(B_t - B_b)/(B_t + B_b)$ where B_t and B_b are the reflected visible radiation from the target and background.

contrast threshold - The minimum target-to-background contrast at which a sensor can operate successfully.

contrast transmission - The rarity of the apparent target-to-background contrast to the inherent target-to-background contrast.

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which the refracted ray should make an angle of 90^0 with the normal. This is called the critical angle, past which internal or total reflection sets in.

critical mass - The smallest mass of fissionable material that will support a self-sustaining chain reaction under stated conditions.

critical point - The thermodynamic state in which liquid and gas phases of a substance coexist in equilibrium at the highest possible temperature. At higher temperatures than the critical, no liquid phase can exist.

critical velocity - The speed at which a current can scour the bottom enough to maintain the required depth in a channel.

crossover, thermal - Various materials heat and cool at different rates. When the target and background radioactive temperatures become equal, the inherent contrast becomes zero.

cross sea - The confused, irregular state of the sea which occurs where waves from two or more different storms have arrived at a point of observation. Sometimes the waves appear to be moving in the same direction as one of the original waves; sometimes in between.

cross spectrum - The Fourier transform of the cross-correlation of two functions.

crosswind - 1. A wind having a component which is directed perpendicularly to the course (or heading) of an exposed, moving object; more popularly, a wind which predominantly acts in this manner. In the broadest sense, any wind except a direct headwind or direct tailwind is a crosswind. 2. That wind vector component which is perpendicular to the course of an exposed moving object. 3. Path averaged crosswind. The average magnitude of the wind vector components perpendicular to a straight horizontal path of specified length. An integrated, path-averaged crosswind can be measured with any of several types of optical crosswind systems and sensors (that is, laser crosswind system and saturation resistant crosswind system.

cue - An item, feature, or signal that enhances target detection or acts as an indication of the nature of the object perceived.

cueing device - A device that receives and displays cues to an observer.

curie - A unit of radioactivity denoting the activity of a quantity of any radioactive species in which 3.700×10^{10} nuclear disintegrations occur per second. The gamma curie is sometimes defined correspondingly as the activity of material in which this number of gamma-ray photons are emitted per second.

current - A horizontal movement of water. See tidal current.

current base - The maximum water area depicting current speeds and directions by current roses, vectors, or other means.

current cross section - A graphic presentation of the current shown as a vertical plane perpendicular to the axis of flow. The horizontal distance between the surface limits is represented by the abscissa, and the depth is shown by the ordinate which increases from the surface (zero) to any depth.

current curve - A graphic representation of the speed and duration of the tidal current usually shown for areas of reversing tidal currents. The curve is referred to rectangular coordinates, the time is represented by the abscissa, and the speed by the ordinate. The flood speeds are positive and the ebb speeds are negative values measured from slack (zero speed).

current diagram - A graphic presentation showing the speed of the flood and ebb currents and the times of slack and strength over a considerable stretch of the channel of a tidal waterway; the times being referred to, tide or current phases, at some reference station.

current difference - The difference between the time of slack water or strength of current in any locality and the time of the corresponding phase of the current at a reference station for which predictions are given in current tables.

current direction - The direction toward which a current is flowing; called the set of the current.

current meter - Any one of numerous devices for the measurement of either speed alone or of both direction and speed (set and drift) in flowing water.

current speed - The rate at which the water moves either horizontally or vertically; usually expressed in knots, miles per day, feet per second, or centimeters per second. See current velocity.

current tables - Tables which give daily predictions of the times, speeds, and directions of the currents. These predictions are usually supplemented by current differences and constants, so additional predictions can be obtained for numerous other places.

current vector - A geometric presentation showing both current direction and speed, generally by an arrow whose length is proportional to the speed and whose direction is resolved into points of the compass.

current velocity - A rate of motion in which direction as well as speed of flow is considered. See current speed.

cyclone - An atmospheric cyclonic circulation or a closed circulation. While modern meteorology restricts the use of the term cyclone to the so-called cyclonic scale circulations, it is popularly still applied to the more or less violent, small-scale circulations such as tornadoes, waterspouts, and dust devils, which may exhibit anticyclonic rotation, and even loosely to any strong wind. The first use of this term was in the very general form for all circular or highly curved wind systems. Because cyclonic circulation and relative low atmospheric pressure usually co-exist, the terms "cyclone" and "low" are used interchangeably in common practice.

cyclonic - Having a sense of rotation about the local vertical the same as that of the Earth's rotation, that is, as viewed from above, counterclockwise in the Northern Hemisphere, clockwise in the Southern Hemisphere, and undefined at the equator.

damping - 1. A characteristic built into electrical circuits and mechanical systems to prevent or to reduce oscillatory conditions. 2. (meteorological) - The suppression of the growth of oscillations or disturbances. Damping usually refers to the decrease, in time, in amplitude or energy of atmospheric disturbances either caused by reversible energy conversion process or the action of viscous or frictional effects.

data - 1. A collection of facts, numbers, letters,and symbols from which a conclusion can be drawn (that is, a representation of information). A plural term collectively used to designate alphabetic or numeric material serving as a basis of discussion; material may or may not be technical in nature. Information, particularly used as a basis for mechanical or electronic computation. 2. (raw) - Unprocessed test data. Different groups, depending on their functions, regard data in various forms as raw. A photographic processing group may regard the latent image as raw data, a reading group may regard the photographic image as raw data, and a computing group may regard certain digital data as raw data.

data assimilator - A device which synchronizes the flow of data between digital systems whose flow rates and internal timing are dependent, different, and/or asynchronous.

data automation - The use of electronic, electromechanical, and mechanical technology and associated techniques to automatically record, communicate, and process data to present the resultant information.

data bandwidth - The difference between the highest and lowest frequency of the data to be telemetered.

data buffer - A device which synchronizes the flow of data between digital systems whose flow rates and internal timing are independent, different and/or asynchronous.

data collection - The act of bringing data from one or more sources to a central location.

data conversion - The process of changing data from one form of representation to another.

data processing - 1. The application of procedures, mechanical, computational, or other means whereby data are changed from one form into another. 2. A generic term encompassing all business machine applications.

data processor (computer) - A device capable of accepting, processing, and reporting information.

data reduction - The process of transforming raw test data or experimentally obtained data usually obtained by instrumentation.

daughter (daughter element) - The nuclide formed by the radioactive decay of another nuclide, which in this context is called the "parent."

day - 1. (apparent solar) - The interval of time from a transit of the Sun across a given meridian to its next successive transit across the same meridian. Since the motion of the Sun is not uniform, apparent solar days vary in length through the year; the maximum deviation from a mean solar day amounting to not quite a half minute in either direction. 2. (astronomical) - A solar day beginning at noon. The astronomical day may be based on either apparent solar time or on mean solar time. It begins 12 hours later than the civil day of the same data. 3. (civil) - A solar day beginning at midnight. The civil day may be based on either apparent solar time or mean time; it begins 12 hours earlier than the astronomical day of the same data. 4. (mean solar) - The interval of time from a transit of the mean sun across a given meridian to its next successive transit across the same meridian. The mean solar day is derived from the average length of the apparent solar day throughout the year. (See time, mean solar). 5. (sidereal) - The interval of time from a transit of the true vernal equinox across a given meridian to its next successive transit across the same meridian. The length of the sidereal day is subject to slight irregularities on account of small differences between the positions of the true equinox, which is affected by precession and notation. (See time; sidereal, equinox). 6. (solar) - The interval of time from the transit of either the Sun or the mean sun across a given meridian to the next successive transit of the same body across the same meridian. The term "day" is frequently used in connection with a particular period in one of the longer scales such as day of the month. In most cases, the term "date" is preferred.

decay - As applied to ocean surface waves, the gradual decrease of surface wave heights owing principally to angular spreading, dispersion, and opposing winds.

decay (or radioactive decay) - The decrease in activity of any radioactive material with the passage of time caused by spontaneous emission from the atomic

nuclei of either alpha or beta particles, sometimes accompanied by gamma radiation. See half-life, radioactivity.

decay area - The area of lesser winds through which ocean waves travel after emerging from the generating area.

decay constant - The fraction of the number of atoms of a radioactive nuclide which decay in unit time.

decay curve - The representation on a graph of a decrease in radioactivity with respect to time.

decay distance - The distance through which ocean waves travel as swell after leaving the generating area.

decay of waves - The change that waves undergo after they leave a generating area (fetch) and pass through a calm or region of lighter winds. In the process of decay, the significant wave height decreases and the significant wavelength increases.

decibar - 1. A unit of pressure used principally in oceanography. One decibar (10^5 dynes per square centimeter) equals 0.1 bar. 2. In the ocean, hydrostatic pressure in decibars very nearly equals the corresponding depth in meters.

decibel (dB) - A value that expresses the comparison of sound of two different intensities. This value is defined as 10 times the common logarithm of the ratio of the two sound intensities.

declination (or variation) - 1. At any given location, the angle between the geographical meridian and the magnetic meridian, that is, the angle between true north and magnetic north. Declination is either east or west accordingly as the compass needle points to the east or west of the geographical meridian. 2. The angle that the Sun, Moon, planets, or stars make the plane of the equator.

declination (astronomy) - The angle at the center of the celestial sphere between the radius passing through a celestial body and the plane of the celestial sphere. Declination is measured by the arc of the hour circle between the celestial body and the equator; it is plus when the body is north of the equator and minus when south of it. It corresponds to latitude on the Earth and with right ascension forms a pair of coordinates which defines the position of a body on the celestial sphere.

decontamination - The removal of radioactive contaminants from surfaces, by cleaning and washing with chemicals.

deep scattering layer (DSL) (or false bottom, phantom bottom) - The stratified populations of organisms in most oceanic waters which scatter sound. The scattered sound is recorded on echo-sounder records as a uniform, horizontal band or stripe, and such layers generally are found during the day at depths from 100 to 400 fathoms. A layer rarely is less than 25 fathoms thick and may be as much as 100 fathoms thick. Several layers often are recorded at the same time and may be continuous horizontally for many miles. Most layers typically undergo diurnal vertical movements. See shallow scattering layer, surface scattering layer, and diurnal vertical migration.

deep water - In wave forecasting, deep water means that the depth of the water is large compared with the wavelength of the longest wave generated by the wind. In general, waves may be considered deep water waves when the depth of the water layer is greater than one-half wavelength.

deep water wave (or short wave) - A surface wave whose length is less than twice the depth of the water. The velocity of deepwater waves is independent of the depth of the water.

deepening - A decrease in the central pressure of a pressure system on a constant-height chart or an analogous decrease in height on a constant-pressure chart; the opposite of filling. The term is usually applied to a low rather than to a high, although technically it is acceptable in either sense. The deepening of a low is frequently used to imply the composite process. Deepening can be quantitatively expressed in at least two ways: as the time rate of central pressure decrease, or as that component of the pressure tendency or any fixed point that is attributed neither to the motion of the pressure system relative to that point nor to the diurnal influence of atmospheric tides.

deliquescence - The process by which a dry particle collects enough water molecules to go into solution and become a droplet.

density - The ratio of any quantity to the volume it occupies, for example, flux density and electron density. Atmospheric density is the ratio of atmospheric mass to the volume it occupies; it is the surrounding water.

density current - The flow (caused by density differences or gravity) of one current through, under, or over another, retaining its unmixed identity because of density differences from the surrounding water.

density layer - A layer of water in which density increases with depth enough to increase the buoyancy of a submarine. (Submariner's term for pycnocline.)

depth - The vertical distance from a specified sea level to the sea floor. The charted depth is the recorded distance from the tidal datum to the bottom surface at

the point, using an assumed velocity of sound in waters of 800 fathoms per second (United States) and with no velocity or slope corrections made.

depth excess - The difference between the bottom depth and the depth at which the sound velocity is equal to either the surface velocity, when there is no layer depth, or the maximum velocity in the surface layer.

depth, exponential mixing - Refers to a surface turbulent mixing layer in which the distribution of a constituent decreases exponentially with height.

depth factor - The factor by which the apparent depth of the water measured stereoscopically is multiplied to give the true depth; the ratio of the tangent of the incidence angle to the tangent of the refraction angle.

depth finder - An instrument for determining the depth of water; an echo sounder.

depth of frictional resistance (or depth of frictional influence) - The depth at which the wind-induced current direction is 180° from that of the true wind.

depth, homogeneous mixing - Refers to a surface turbulent mixing layer in which the distribution of a constituent is constant with height.

derelict - Any property abandoned at sea, often of sufficient size to constitute a menace to navigation.

designator - A device used to illuminate or irradiate a target or other object (for example, a laser designator or a spotlight).

designator, laser - A device capable of marking a target with a laser spot once the target has been acquired.

detection, liminal - Detection under conditions where the probability of success is 0.50.

detection, target - In the target acquisition cycle, when an object is seen by the sensor.

detector, radiation - Any device for converting radiant energy to a form more suitable for observation.

dew point - 1. The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content for saturation to occur. When this temperature is 0 °C, it is sometimes called the frost point. 2. The

diabatic - A thermodynamic process in which heat enters or leaves the system.

differential absorption technique - A technique that uses a two-wavelength laser radar to measure remotely molecular concentrations. The wavelengths are chosen at a peak and valley of a molecular absorption spectrum, and the difference in the lidar return at the two wavelengths is then a measure of the particular molecular concentration.

diffracted wave - A wave whose front has been changed in direction by an obstacle or other nonhomogeneity in the medium other than by reflection or refraction.

diffraction - The bending of waves (sound, water, and light) around obstacles. For example, when a portion of a train of waves is interrupted by a barrier such as a breakwater, the effect of diffraction is manifested by the propagation of waves into the sheltered region within the barrier's geometric shadow.

diffuse attenuation function - Mathematical formulation of the relationship between the illuminance (E_0) at the surface, the illuminance (E_X) at a depth (X), and the attenuation coefficient (k).

$$E_X = E_0 e^{-kX}$$

(Strictly, this equation relates to monochromatic light only, but it is a sufficient approximation to illuminance data for practical purposes.)

diffuse front - A front across which the characteristics of wind shift and temperature change are weakly defined.

diffusion - 1. The spreading or scattering of matter under the influence of a concentration gradient with movement from the stronger to the weaker solution. 2. Molecular diffusion is the process by which contiguous fluids mix slowly, despite differences in their density.

diffusion coefficient - The constant of proportionality between the rate of diffusion across a plane area and the concentration gradient normal to that plane.

diffusivity - A measure of the rate of diffusion of a property appearing as the factor K in the diffusion equation where q is the property diffused and the Laplacian operator. Diffusivity has dimensions of length times velocity. It varies with the property diffused and for any given property may be considered a constant or a function of temperature and space depending on the context.

directional spectrum - The spectral distribution of wave energy by both frequency and direction.

directivity - The confining of sound to a beam by mechanical and/or electronic means.

directivity index - A measure of sound pressure level in one direction compared to that in all other directions.

direct tide - A gravitational solar or lunar tide in the ocean which is in phase with the apparent motions of the attracting body and consequently has its local maximums directly under the tide-producing body on the opposite side of the Earth.

disintegration constant - The fraction of the number of atoms which decay in unit time of a radio active nuclide.

disintegration, nuclear - A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and/or mass from the nucleus. When numbers of nuclei are involved, the process is characterized by a definite half-life.

dispersion - 1. The separation of a complex surface gravity wave disturbance into its component parts. See acoustic dispersion.

distribution - Arrangement in time or space as the distribution of temperature; apportionment among various classes or class intervals, especially ranges of values of a certain variable.

disturbance - In general, any agitation or disruption of a steady state. In meteorology, this term has several rather loose applications: 1. Used for any low or cyclone but usually one that is relatively small in size and effect. 2. Applied to an area where weather, wind, and pressure show signs of the development of cyclonic circulation. 3. Used for any deviation in flow or pressure that is associated with a disturbed state of the weather for example, cloudiness and precipitation. 4. Applied to any individual circulatory system within the primary circulation of the atmosphere.

diurnal cooling - Heat lost by the surface of a body of water during the night. This radiational loss manifests itself in a small and transient positive gradient of temperature that is observed near the surface in calm weather. See diurnal heating.

diurnal heating - Solar radiation absorbed by a body of water during the daylight hours. This short-wave radiation (caused by heating the upper layer of the water) creates, in the absence of wind, a small and transient surface thermocline. See diurnal cooling.

diurnal range - 1. The amount of variation between the maximum and minimum of any element during 24 hours. 2. Contracted form of great diurnal range.

divergence - 1. A horizontal flow of water, in different directions, from a common center of zone; often associated with upwelling. 2. In refraction phenomena, the increasing of the distance between orthogonals in the direction of wave travel. Denotes an area of decreasing wave height and energy concentration.

divergence loss - The part of the transmission loss which is caused by the spreading of sound rays in accordance with the geometry of the situation. For example, spherical waves emitted by a point source will be only half as great as the sound pressure 10 yards from the source.

doppler effect - The thermal motion of atmospheric molecules which causes the spectrum of scattered laser light to be broadened to the original radiated spectrum. Can be used as a measure of atmospheric temperature.

doppler shift - The change in frequency of a wave reaching an observer or a system caused by a shift in distance or range between the source and the observer or the system during the interval of reception.

dose - A quantity (total or accumulated) of ionizing or nuclear radiation. The absorbed dose in rads represents the amount of energy absorbed from the radiation per gram of specified absorbing material. In soft body tissue, the biological dose (also called the relative biological effectiveness (RBE) dose) in rems is a mixture of the biological effectiveness of the absorbed radiation. See exposure, rad, relative biological effectiveness, and roentgen.

dose distance curve - Graphical representation of observed or estimated dose versus distance data.

dose rate - As a general rule, the amount of ionizing (or nuclear) radiation which an individual or material would receive per unit of time; usually expressed as rads (or rems) per hour or in multiples or submultiples of these units such as millirads per hour. This term is commonly used to indicate the level of radioactivity in a contaminated area. See survey meter.

dose ratemeter - Any instrument which measures radiation dose rate.

dosimeter - An instrument for measuring and registering the total accumulated dose of (or exposure to) ionizing radiations. Instruments worn or carried by individuals are called personnel dosimeters.

down time - The period during which a computer or other equipment is malfunctioning because of machine failure; contrasted with available machine time, idle time, or standby time.

drag coefficient - A nondimensional coefficient (C_D), also termed the "skin-friction coefficient," which is defined by the equation $\tau = C_{D\rho}U_s^2$, where τ is the Reynolds Stress (surface shearing stress), ρ the air density, and U_s the windspeed observed near the surface.

dragon's tail - A towed thermistor chain used to measure sea temperature.

drift - 1. The effect of the velocity of fluid flow upon the velocity (relative to a fixed point) of an object moving within the fluid. The vector difference between the velocity of the object relative to the fluid and its velocity to the fixed reference. 2. In publications for the mariner, drift is the speed of a current or ice flow usually given in nautical miles per day or in knots. For the oceanographer, drift is a wide, slow-moving current principally caused by winds. 3. Any rock material like boulders, till, gravel, sand, or clay transported by a glacier and deposited by the ice or by the water from the melting ice.

drift bottle (or bottle post) - A bottle (can be of various design) which is released into the sea for use in studying current. Each contains a card (bottle paper) identifying the date and place of release which is to be returned by the finder with the date and place of recovery.

drift current (or ocean current) - 1. Wide, slow-moving ocean current principally caused by winds. Examples are the extension of the North Atlantic Current (the North Atlantic Drift) and the West Wind Drift. See wind driven current. 2. Current determined from the differences between dead reckoning and a navigational fix. 3. Current defined by assuming that the wind stress is balanced by the sum of the coriolis and frictional forces.

drizzle - Precipitation composed exclusively of water drops smaller than 0.02 in diameter.

dropsonde (or parachute radiosonde) - A radiosonde which is dropped by parachute from an aircraft for the purpose of obtaining a sounding of the atmosphere below.

dry-bulb temperature - The temperature of the air as measured by the dry-bulb thermometer of a psychrometer.

dry deposition - In the absence of precipitation, the impaction process in which atmospheric turbulence deposits radioactive particles on the surface (ground, building, and vegetation). The controlling transfer process for particles generally less than 10 um. This term is also often used to denote fallout which is a completely different transfer process.

ducting - 1. The trapping of an electromagnetic wave in a waveguide action between two layers of the Earth's atmosphere or between a layer of the atmosphere and the Earth's surface. Likely to occur where the refractive index gradient exceeds 48 N-units per 1,000 feet altitude. See refractivity. 2. In acoustics, a condition where sound rays are channeled between two layers of the atmosphere or sea.

duration - 1. The interval of time of the rising or falling tide or the length of time of flood or ebb tidal currents. 2. In wave forecasting, the length of time the wind blows in essentially the same direction over the fetch.

dynamic height - The height of a point in the atmosphere expressed in a unit proportional to the geopotential at that point (geodynamic height). Since the geopotential at altitude z is numerically equal to the work done when a particle of unit mass is lifted from sea level up to this height, the dimensions of dynamic height are those of potential energy per unit mass.

dynamic oceanography - 1. The study of oceanographic motions as solutions of the fundamental equations of hydrodynamics or other systems of equations appropriate to special situations. 2. The restrictions of this definition suffice to distinguish dynamic oceanography from other fields, for example, physical oceanography or synoptic oceanography (such distinctions being a function of the state of the science rather than of the subject matter itself).

dynamic prediction - Methods of predicting the future state of the environments by using physical models as opposed to empirical or statistical methods.

dynamic pressure - The dynamic pressure at a point is the difference between the static pressure at that point and the total pressure at the stagnation point of the same streamline. A measure of the kinetic energy of a fluid.

dynamic stability - A term sometimes used in a restricted sense as a synonym of inertia stability.

dynamic viscosity - A coefficient defined as the ratio of the shear stress to the velocity gradient.

dynamometer (sometimes called strain gauge) - An instrument used in bottom sampling or other oceanographic operations to indicate that the bottom has

been reached. The instrument measures variation on wire tension and is only effective to depths where the tension caused by the weight of the sampling device is somewhat greater than the tension caused by the weight of the lower cable and the variable loads produced by ship motion.

Earth structure - The postulated structure and composition of the Earth by assuming concentric layering around a core based on gravity, density distribution, seismology, and laboratory determinations of physical and chemical properties of rocks.

ebb current - The tidal current associated with the decrease in the height of a tide. Ebb currents generally set seaward or in an opposite direction to the tide progression. Erroneously called ebb tide.

echo - An acoustic signal which has been reflected or otherwise returned with sufficient magnitude and time delay to be detected as a signal distinct from that directly transmitted.

echo radar - That portion of the radar's transmitted RF energy which is reflected from a target.

echo ranging - Determination of distance by measuring the time interval between transmission of a radiant energy signal (sound) and the return of its echo.

echo sounding (or acoustic sounding) - Determination of the depth of water by measuring the time interval between the emission of a sonic or ultrasonic signal and the return of its echo from the bottom. The instrument used for this purpose is called an echo sounder.

ecliptic - The great circle of the celestial sphere traced by the plane of the Earth's orbit (center of gravity path of Earth-Moon system). The ecliptic represents very closely but not exactly, the apparent path of the Sun in the sky. The points at which the ecliptic intersects the celestial equator are the equinoxes, and the angle of intersection is the obliquity of the elliptic.

eddy - 1. By analogy with a molecule, a "blob" of fluid within the fluid mass that has a certain integrity and life history of its own; the activities of the bulk fluid being the net result of the motion of the eddies. The concept is applied with varying results to phenomena ranging from the momentary spasms of the wind to storms and anticyclones. 2. Any circulation drawing its energy from a flow of much larger scale and brought about by pressure irregularities as in the lee of a solid obstacle. 3. A circular movement of water usually formed where currents pass obstructions between two adjacent currents flowing counter to each other or along the edge of a permanent current. 4. A discreet mass of fluid. 5. A term in fluid motion (like the closely associated term "turbulence,") for which a brief, comprehensive definition is impossible.

eddy conductivity - 1. Exchange coefficient (K), of dimensions $L^2 T^{-1}$ relating to the transfer of heat effected by eddies. 2. The exchange coefficient for eddy heat conduction.

eddy correlation - States that gusts are more frequently associated with downward moving air and lulls with upward-moving air than vice versa.

eddy diffusion - 1. The mixing of atmospheric matter and properties which is effected by eddies. 2. (or turbulent diffusion) The transfer of matter by the turbulent eddies in a fluid.

eddy diffusion coefficient - The exchange coefficient for the diffusion of a conservative property by eddies in a turbulent flow.

eddy diffusity - Same as eddy diffusion coefficient.

eddy flux - 1. The rate of transport of a fluid property such as momentum, mass, heat, or suspended matter by means of eddies in turbulent motion. 2. The rate of transport (or flux) of fluid properties such as momentum, mass, heat, or suspended matter by means of eddies in a turbulent motion; the rate of turbulent exchange. 3. The rate of transport of atmospheric properties and matter (heat, momentum, and water vapor) which is effected by atmospheric eddies.

eddy spectrum - Specification of the character of turbulence in terms of the partition of kinetic energy between eddies of various sizes.

eddy viscosity - 1. The turbulent transfer of momentum by eddies giving rise to internal fluid friction in a manner analogous to the action of molecular viscosity in laminar flow but taking place on a much larger scale. 2. The value of the coefficient of eddy viscosity is of the order 10^{-4} square centimeters per second.

edge wave - An ocean wave traveling parallel to a coast with crests normal to the coastline. Such a wave has a height that diminishes rapidly seaward and is negligible at a distance of one wavelength offshore.

effective acoustic center (apparent source) - The effective acoustic center of an acoustic generator is the point from which the spherically divergent sound waves observable as remote points appear to diverge.

egs system - The system of physical measurements in which the fundamental units of length, mass, and time are the centimeter, gram, and second.

Ekman current meter - A mechanical device for measuring ocean current velocity. A sensitive impeller is turned by current action and the number of turns recorded on an attached dial. Speed is measured indirectly from the number of impeller revolutions by means of conversion tables. Lead shot is dropped into a compass box below the meter for a set number of impeller revolutions. Current direction is determined from the location of the shot dropped in the compass box.

Ekman layer - The layer of transition between the surface boundary layer where the shearing stress is constant and free atmosphere where the atmosphere is treated as an ideal fluid in approximate geostrophic equilibrium.

Ekman spiral - A theoretical representation of the effect that a wind blowing steadily over an ocean of unlimited depth and extent and of uniform viscosity would cause the surface layer to drift at an angle of 45^0 to the right of the wind direction in the Northern Hemisphere.

electro-optics (EO) - Originally the term referred to the joint disciplines of optics and electronics having to do with the transformation of electrical energy into light, or vice versa, by using of an optical device and was thus restricted to the visible portion of the electromagnetic spectrum. The EO systems are now considered to include optical and photoelectric devices, those devices working in the passive infrared region, and lasers. All these systems employ sensors whose operation depends upon the transmission of radiation through the natural environment. Some systems also depend on the transference of image-forming contrast throughout the atmosphere. For natural environmental effects on EO devices. See absorption, atmospheric boil, scattering, structure function, turbidity, and visibility.

electron - A particle of very small mass carrying a unit negative or positive charge. Negative electrons surrounding the nucleus (orbital electrons) are present in all atoms; their number being equal to the number of positive charges (or protons) in the particular nucleus. The term "electron," where used alone, commonly refers to negative electrons. A positive electron is usually called a positron, and a negative electron is sometimes called a negatron.

elevation angle, Sun - See solar angle.

emission - The generation and sending out of radiant energy.

emissive power - See emittance.

emissivity (or emissive power) - 1 The ratio of the emittance of a given surface at a specified wavelength and emitting temperature to the emittance of an ideal blackbody at the same wavelength and temperature. The greatest value that

an emissivity may have is unity. The least value is zero. 2. A corollary of Kirchoff's law that the emissivity of any surface at a specified temperature and wavelength is exactly equal to the absorptivity of that surface at the same temperature and wavelength.

emissivity, spectral ($\varepsilon\lambda$) - The ration of the emittance (emitted energy) of a given surface at a specified wavelength and temperature to the emittance of an ideal blackbody at the same wavelength and temperature.

emittance (or emissive power) - A measure of the total radiant energy emittted per unit time per unit area of emitting surface; the total flux of electromagnetic radiation emitted by the unit surface area into a full hemisphere (2π steradians).

energy, thermal - Heat. Energy transferred between systems because of differences in temperature, by radiation, or by convection.

energy, threshold - The minimum energy level at which a sensor can operate. Even if the energy contrast between target and background is great, the sensor cannot perceive the contrast if both the target or background energies are below the sensor's threshold energy.

ensemble average - Compilation of measurements from many places but not necessarily at the same time.

entrainment - In meteorology, the mixing of environmental air into a pre-existing organized air current so that the environmental air becomes part of the current.

envelope, bomb - A sector which describes the maximum and minimum attack angle within which a bomb can be released based on the bomb's aerodynamic characteristics.

envelope, launch - A sector describing the maximum and minimum attack angles within which a missile can be launched; based on the missile's aerodynamic characteristics.

environment - The sum total of all the external conditions which may affect an organism, community, material, or energy if brought under the influence of these external conditions.

environmental conditions - Specified external conditions (shock, vibration, and temperature) to which a device may be exposed during shipping, storage, handling, and operation which may adversely affect its performance or reliability.

ephemeris - A tabular statement presenting positions and related data for celestial bodies for given epochs (dates) at uniform intervals of time. Also, a publication containing such data for a number of celestial bodies. Such publications like the American Ephemeris and Nautical Almanac contain specified moments of time for the numerical values of coordinates of the principle celestial bodies; referred to circles whose positions are independent of the diurnal rotation of the Earth. They also contain the elements of the positions of the reference circles and the numbers used in computing the effects on which those coordinates of changes in the position of the observer and in general all those phenomena relating to the heavenly bodies. The term "ephemeris" relates to a number of celestial bodies. Where specific mention is made of those bodies, the plural form, ephemerides, is used (as in, the ephemerides of the planets). For a single body, the singular form is used (for example, the ephemeris of the Sun).

equator astronomic - The line on the surface of the Earth whose astronomic latitude at every point is 0°. (Also termed the terrestrial equator.) Because of the deflection of the plumb line, the astronomic equator is not a plane curve. However, the verticals at all points on it are parallel to one and the same plane, the plane of the celestial equator, for example, the zenith at every point on the astronomic equator lies in the celestial equator.

equation of motion - The Newtonian law of motion which states the product of the mass of an elemental volume of fluid and acceleration equals the vector sum of the forces acting on the volume. In meteorological and oceanographic use, both sides of the equation of motion are divided by mass to give force per unit mass. The forces considered in ocean currents are gravity, coriolis, pressure gradient, and frictional.

equinox - 1. The point of intersection of the celestial equator and the ecliptic.
2. (autumnal) - The point of intersection of the celestial equator and the ecliptic, apparently traversed by the Sun in passing from north to south.
3. (vernal) - The point of intersection of the celestial equator and the ecliptic, apparently traversed by the Sun in passing from south to north. The vernal equinox is also called the "first point of Aires" and "first of Aires." It is the point from which right ascension is reckoned along the celestial equator and celestial longitude along the ecliptic. The position of the true equinox is affected by precession and nutation, while the position of the mean equinox is affected by precession but not by nutation. See day, sidereal; time, sidereal.

ergodic hypothesis - Assumes time statistics are the same as ensemble statistics. This hypothesis is only correct if turbulence is stationary.

eulerian coordinates - Any system of coordinates in which properties of a fluid are assigned to points in space at a given time without attempting to identify individual fluid parcels from one time to the next.

evapotranspiration - The combined processes of evaporation from the Earth's surface and transpiration for vegetation.

exchange coefficient - 1. A general term for the coefficients of viscosity (momentum), conductivity (heat), and diffusivity (matter), which are defined (analogous to molecular exchange processes) with respect to the vertical transfer affected by atmospheric eddies. 2. Coefficients of eddy flux in turbulent flow. The exchange coefficient hypothesis states that the mean eddy flux per unit area of a conservative property (suitably expressed) is proportional to the gradient of the mean value of the quantity.

exosphere (region of escape) - The outermost or topmost portion of the atmosphere. Its lower boundary is the critical level of escape, variously estimated at 500 to 1000 km above the Earth's surface. In the exosphere, the air density is so low that the mean free path of individual particles depends on their direction with respect to the local vertical, being greatest for upward moving particles. It is only from the exosphere that atmospheric gases can to any appreciable extent escape into outer space.

expendable bathythermograph - See airborne expendable bathythermograph, shipborne expendable bathythermograph.

exposure - A measure, expressed in roentgens of the ionization, produced by gamma (or X) rays in the air. The exposure rate is the exposure per unit time (for example, roentgens per hour). See dose, dose rate, roentgens.

extinction coefficient - 1. A measure of the space rate of diminution or extinction of transmitted electromagnetic radiation; thus, it is the attenuation coefficient applied to visible radiation. 2. In oceanography, it is a measure of the attenuation of downward directed radiation in the sea. See attenuation coefficient. 3. The sum of the absorption coefficient and the scattering coefficient for a medium that both absorbs and scatters radiation. Generally applies to visible radiation.

extreme values (climatology) - The highest and, in some cases, the lowest value of a climatic element observed during a given period or during a given month or season of that period. If this value is for the whole period for which observations are available, it is the absolute extreme.

eye (meteorology) - usually the "eye of the storm" (hurricane, typhoon); that is, the roughly circular area of comparatively light winds and fair weather found at the center of a severe tropical cyclone. The winds are generally 10 knots or less, no rain occurs, and sometimes blue sky may be seen. Eye diameters vary from 4 to more than 40 miles. Common magnitudes seem to be 12 to 25 miles. Modern observations indicate that the eye does not remain in steady state but is continuously undergoing changes in shape and size.

Fahrenheit temperature scale (F) - A temperature scale in which 32° represents the ice point and 212° the boiling point of water at sea level.

fair (meteorology) - Generally descriptive of pleasant weather conditions with regard for location and time of year. A purely subjective description that is subject to popular misinterpretation. When this term is used in United States Weather Bureau forecasts, it is meant to imply no precipitation, less than 0.4 sky cover of low clouds, and no other extreme conditions of cloudiness, visibility, or wind.

falling tide (or ebb tide) - The portion of the tide cycle between high water and the following low water.

falloff - In underwater sound, the decrease in acoustic energy as it travels away from the sound source.

fallout - The process or phenomenon on the Earth's surface of particles contaminated with radioactive material from a radioactive cloud. The term is also applied in a collective sense to that contaminated particulate which reaches the Earth within 24 hours after a nuclear explosion. Delayed (or worldwide) fallout consists of the smaller particles which ascend into the upper troposphere and into the stratosphere and are carried by winds to all parts of the Earth. Such fallout is brought to Earth mainly by rain or snow over extended periods ranging from months to years.

fallout pattern - The delineation of an area covered by radioactive fallout using isodose rate contours derived from actual measurements. Raw dose rate monitoring data are normalized to some reference time, for example, H+1 hour, H+12 hours, or H+24 hours using appropriate decay rates.

fallout scaling model - Empirically derived parameters and a normalized (H+1 hour) exposure rate versus distance curve from a previous event which are used in the scaling technique to produce exposure versus distance estimates for a new event.

fallout scaling technique - A simple ratio technique whereby the parameters which determine the hotline exposure rates and the location of these exposure rates in their respective fallout patterns are related. Used in conjunction with the empirical results of a previous venting for prediction purposes.

false bottom - See deep scattering layer.

fathom - The common unit of depth in the ocean for countries using the English system of units; equal to 6 feet (1.83 meters). Also used in expressing horizontal distances, in which case 120 fathoms make one cable. NOTE: 1/10 nautical mile = 607.6 feet (100 fathoms ≅1/10 nautical mile).

feeling bottom - The action of a deepwater wave on running into shoal water and beginning to be influenced by the bottom.

fetch (or generating area - 1. An area of the sea surface over which seas are generated by a wind having a constant direction and speed. 2. The length of the fetch area measured in the direction of the wind in which the seas are generated.

fetch length - The horizontal distance (in the direction of the wind) over which a wind having a constant direction and speed generates a sea.

field of view - 1. The solid angle in the object space for which objects can be acceptably viewed, photographed, or otherwise detected. 2. (transducer) The solid angle or the angle in a specified plane over which radial energy incident on a transducer is measured within specified tolerances.

Fickian-type diffusion - The exchange of fluid particles (and hence the transport of conservative properties) between regions in space in the apparently random motions of a scale too small to be treated by the equations of motion.

filling - In meteorology, an increase in the central pressure of a pressure system on a constant-height chart or an analogous increase in height on a constant-pressure chart; the opposite of deepening, which is commonly applied to a low rather than to a high.

film badge - A package of photographic film worn like a badge by workers in the nuclear industry to measure exposure to ionizing radiation. The absorbed dose can be calculated by the degree of film darkening caused by the irradiation.

filtering - The processing of values of a variable to emphasize certain patterns of variation while suppressing others. The object is generally to isolate oscillation lying within a certain wave band or range of frequencies while reducing noise and oscillations in other wavebands.

finite difference - The difference between the values of a function at two discrete points; used to approximate the derivative of a function.

fireball - The luminous ball of hot gases which forms a few millionths of a second after a nuclear explosion.

first gust - The sharp increase in windspeed often associated with the early mature stage of a thunderstorm cell. It occurs with the passage of the discontinuity zone which is the boundary of the cold-air downdraft. The first gust can reach destructive speeds.

fission - The process whereby the nucleus of a particular heavy element splits into (generally) two nuclei of lighter elements with the release of a substantial amount of energy. The most important fissionable materials are uranium-235 and plutonium- 239. Fission is caused by the absorption of neutrons.

fission products - 1. A general term for the complex mixture of substances produced as a result of nuclear fission. A distinction should be made between these products and the direct fission products or fission fragments which are formed by the actual splitting of the heavy-element nuclei. 2. Sometimes upwards of 80 or more different fission fragments result from roughly 40 different modes of fission for a given nuclear species (for example, uranium-235 or plutonium-239). Being radioactive, the fission fragments immediately begin to decay, forming additional (daughter) products. As a result, the complex mixture of fission products so formed contains over 300 different isotopes of 36 elements.

fission yield - The amount of energy released by fission in a nuclear explosion as distinguished from that released by fusion.

fissionable material - Any material readily fissioned by slow neutrons, for example, uranium-235 and plutonium-239.

flattening of the Earth - 1. The ratio of the difference between the equatorial and polar radii of the Earth (major and minor semiaxis of the spheroid) to its equatorial radius (major semiaxis). The flattening of the Earth is the ellipticity of an ellipse forming a meridional section of the spheroid. If a and b represent major and minor semiaxes of the spheroid, and f is the flattening of the Earth, thus

$$f = \frac{a - b}{a}$$

Also, the magnitude of the flattening is sometimes expressed by stating the numerical value of the reciprocal of the flattening, $\frac{a}{a-b}$. 2. The flattening of the Earth is also termed "compression."

flight profile - The flight path, airspeed and altitude of an aircraft as a function of time.

flux - The rate of flow of some quantity.

flux density - 1. The flux (rate of flow) of any quantity through a unit area of specified surface. 2. The ratio of transport (flux) of a specified quantity (for example, radiation) across a unit area of a surface.

flux, luminous - The flux of visible radiation weighted to account for the manner in which the response of the human eye varies with the wavelength of radiation.

flux, radiant - The rate of flow of radiant energy having dimensions of power per unit area.

footcandle (ftc) - A unit of illuminance; 1 lumen incident per square foot.

footlambert - A unit of luminance or photometric brightness; 1/3.14 candle per square foot.

forward looking infrared (FLIR) - An acquisition system designed to look forward from an aircraft that senses radiation in either the 3- to 5μm- or 8- to 14 μm wavelength region of the electromagnetic spectrum.

fovea - The small rodless area of the central retinal region of the eye affording acute vision.

free atmosphere - The atmosphere above the friction layer; that is, 600 meters above ground where the influence of surface friction on air motion is assumed negligible.

freezing level - Commonly used in aviation terminology to denote the lowest altitude in the atmosphere over a given location at which the air temperature is 0 °C; the height of the 0° constant-temperature surface. This simple concept may become slightly complicated by the existence of one or more above-freezing layers formed by temperature inversions at altitudes higher than the above-defined freezing level. In cloud physics terminology, this is more accurately termed the melting level, because melting ice always occurs very near 0 °C, but liquid cloud drops may remain supercooled to much colder temperatures.

frequency bands (commonly used terms)

Band	Frequency/Remarks
VLF (Very Low Frequency)	Below 30 kHz - Myriametric waves
LF (Low Frequency)	30 to 300 kHz - Kilometric waves
MF (Medium Frequency)	300 to 3000 kHz - Hectometric waves
HF (High Frequency)	3 to 30 MHz - Decametric waves
VHF (Very High Frequency)	30 to 300 MHz - Metric waves
UHF (Ultra High Frequency)	300 to 3000 MHz - Decimetric waves
SHF (Super High Frequency)	3 to 30 GHz - Centimetric waves
RHF (Extremely High Frequency)	30 to 300 GHz - Millimetric waves
VHF Communications Band	132 to 174 MHz
UHF Communications Band	225 to 400 MHz
Telemetry Bands	216 to 260 MHz
	1435 to 1535 MHz
	220 to 2290 MHz
Command Control Bands	406 to 549 MHz
	4400 to 4800 MHz
*P-band	225 to 390 MHz
*L-band	390 to 1550 MHz
*S-band	1550 Mhz to 5.2 GHz
*C-band	3.9 to 6.2 GHz
*X-band	5.2 to 10.9 GHz
*K-band	10.9 to 36 GHz

NOTE: The terms marked with an asterisk (*) are not recognized officially and their use should be avoided in official correspondence and technical documents.

frequency - The rate of recurrence of an event in periodic motion.

frequency distribution (or fluctuating variables) - A curve whose coordinates are the values of the variable and the frequency of occurrence. Often presented as a histogram.

friction velocity - 1. A convenient reference velocity for which the virtual stresses set up by the turbulence are proportional to the square of the mean velocity. 2. That reference velocity (μ^*) employed in the study of fluid flow over a rough surface, which is defined by the equation

$$\mu^* = \sqrt{(\tau_0 / \rho)}$$

where τ_0 is the surface drag per unit area and ρ is the fluid density.

front (meteorology) - Generally, the interface or transition zone between two air masses of different density. Since temperature distribution is the most important regulator of atmospheric density, a front almost invariably separates air masses of different temperatures. Along with the basic density criterion and the common temperature criterion, many other features may distinguish a front such as a pressure trough, a change in wind direction, a moisture discontinuity, and certain characteristic cloud and precipitation forms. The term front is used for (1) frontal zone, the three-dimensional zone or layer of large horizontal density gradient bounded by frontal surfaces across which the horizontal density is discontinuous (Frontal surface refers specifically to the warmer side of the frontal zone.), and (2) surface front, the line of intersection of a frontal surface or frontal zone with the Earth's surface or, less frequently, with a specified constant-pressure surface.

Froude number - In fluid flow, a nondimensional parameter (Fr) defined by the relationship $(Fr) = U \sqrt{(\delta g)}$, where U is the free stream velocity, δ the thickness of the boundary layer, and g the gravitational acceleration.

fusion - The process whereby the nuclei of light elements, especially those of the isotopes of hydrogen (namely deuterium and tritium) combine to form the nucleus of a heavier element with the release of substantial amounts of energy. See thermonuclear.

gamma rays (or radiation) - Electromagnetic radiations of high energy originating in atomic nuclei and accompanying many nuclear reactions (for example, fission, radioactivity, and neutron capture). Physically, gamma rays are identical to X-rays or high energy. The only essential difference is that X-rays do not originate from atomic nuclei but are produced in other ways (for example, by slowing down (fast) electrons of high energy).

gaussian distribution - A theoretical frequency distribution that is bell shaped, symmetrical, and of infinite extent.

Geiger counter - A radiation detection and measuring instrument containing a gas-filled tube which discharges electrically when ionizing radiation passes through it. These discharges are counted to measure the radiation's intensity.

general circulation (meteorology) - In its broadest sense, the complete statistical description of atmospheric motions over the Earth. These statistics are generated from the ensemble of daily flow patterns. They include not only the temporal and spatial mean conditions (for example, zonal westerlies and easterlies, semipermanent waves, and meridional cells) which are sometimes called the general circulation, but also the higher-order statistics which measure the spatial and temporal variability of the flow resulting from seasonal change and from the effects of transient cyclones and anticyclones.

geodetic - 1. The circle on the spheroid midway between its poles of revolution. The geodetic equator is the line of 0° geodetic latitude 4 from which geodetic latitudes are reckoned, north and south, to 90° at the poles . The plane of the geodetic equator cuts the celestial sphere in a line coinciding with the celestial equator, because the axis of the spheroid of reference is by definition parallel to the axis of rotation of the Earth. 2. For the geodesic line from A to B, the angle between the tangent to the median at A and the tangent to the geodesic line at A. In the United States Coast and Geodetic Survey, this angle is measured clockwise from south. This azimuth is called the forward azimuth for the line AB. The angle between the tangents to the meridian and to the geodesic line at B is called the back azimuth for the line AB. Because of the convergence of the meridians, the forward and backward azimuths of a line do not differ exactly by 180°, except where the two end points have the same geodetic longitude or where the geodetic latitudes of both points are 0°. The geodesic line is not, except in special cases, a plane

curve. For short lines of the length commonly used in triangulation, the small difference between the geodesic line and the plane curve actually observed may be neglected.

geological oceanograph - The study of the floors and margins of the oceans including descriptions of submarine relief features, the chemical and physical composition of bottom materials, the interaction of sediments and rocks with air and sea water, and the action of various forms of wave energy in the submarine crust of the Earth.

geologic time scale - The divisions of time from the formation of the Earth to the present into eras, periods, and epochs based primarily upon fossil evidence.

geomagnetic equator - A great circle on the Earth's surface that is everywhere equidistant from the magnetic poles, that is, the equator in the system of geomagnetic coordinates.

geomagnetic pole - The point where the axis of a centered dipole that most nearly duplicates the Earth's magnetic field would intersect the surface of the Earth. The Earth's geomagnetic poles are located approximately 78.5° N, 69.0° W, and 78.5° S, 111.0° E.

geometrical horizon - The locus of points at which straight lines from the point of reference become tangential to the Earth's surface.

geophysics - The science of the Earth with respect to its structure, composition, and development. Geophysics is a branch of experimental physics dealing with the Earth including its atmosphere and hydrosphere. It includes geodesy, geology, seismology, meteorology, oceanography, magnetism, and other Earth Sciences in collecting and interpreting Earth data. Geophysical methods have been applied successfully to the identification of underground structures in the Earth and to the search for structures of a particular type; for example, those associated with oil-bearing sands.

geopotential height - The height of a given point in the atmosphere in units proportional to the potential energy of unit mass (geopotential) at this height, relative to sea level. The relation in the egs system, between the geopotential height Z and the geometric height z is

$$Z = \frac{1}{980} \int_0^z g\,ds$$

where g is acceleration of gravity, so that the two heights are numerically interchangeable for most meteorological purposes. Also, one geopotential meter is equal to 0.98 dynamic meter. At the present time, the geopotential

height unit is used for all aerological reports by convention of the World Meteorological Organization.

geosphere - 1. The solid portion of the Earth including water masses; the lithosphere plus the hydrosphere. 2. Above the geosphere lies the atmosphere and at the interface between these two regions is found all of the biosphere or zone of life.

geostrophic current - A current defined by assuming that an exact balance exists between the horizontal pressure gradient and the coriolis force. The usual manner of deriving geostrophic currents is to prepare a dynamic topography chart which is based on observations of temperature and salinity at various depths for a network or a line of oceanographic stations. The direction of the current is indicated by the contours of dynamic topography and its speed by the spacing of the contours.

geostrophic equation - An equation which represents a balance between the horizontal pressure gradient and the coriolis force. The equation used to compute the speed of the current is

$$V = C\left(\frac{D_a - D_b}{L}\right)n$$

where

$$C = \frac{1}{2\omega \sin\phi .10^5}$$

Da - Db = difference in dynamic height anomalies at the stations A and B in dynamic meters
n = unit conversion factor
L = distance between stations
V = speed in knots
w = angular velocity of the Earth
ϕ = latitude

geothermal gradient - The change in temperature of the Earth with depth, expressed either in degrees-per-unit depth or in units of depth per degree.

glint - A bright flash of light reflected from a surface.

gradient - 1. The rate of decrease of one quantity with respect to another, for example, the rate of decrease of temperature with depth. 2. The gradient of a function in three space dimensions is a vector normal to surfaces of constant value of the function and directed toward decreasing values with magnitude equal to the rate of decrease of the function in this direction.

gravity formula, international - A development of the formula for theoretical gravity based on the assumptions that the spheroid of reference is an exact ellipsoid of revolution having the dimensions of the International Ellipsoid of Reference (Madrid, 1924) rotation about its minor axis once in a sidereal day, that the surface of the ellipsoid is a level surface; and that gravity at the equator equals 978.049 gals. Omitting terms which are so small as to be negligible for practical purposes, the International Gravity Formula is

$$g = 978.049 \, (\, 1 + 0.0052884 \sin^2\phi - 0.0000059 \sin^2\phi)$$

The International Gravity Formula was adopted by the International Association of Geodesy at the Stockholm meeting in 1930. The purpose was not primarily to represent the gravity observations, although $g_e = 978.049$ gals was based on those observations, but rather it was intended to put the determination of the figure of the Earth from gravity data on the same basis as the determination of its figure from deflections of the vertical. This formula is based on the Potsdam value for absolute gravity.

gravity formula, longitude term - A suggested additional term for the formula for theoretical gravity derived from the longitude of a spheroid of reference having three unequal axes. With this additional term, the formula for theoretical gravity would be

$$g = e[1 = \beta \sin^2\phi - \beta \sin^2\phi \pm c \cos^2\phi \cos^2(\lambda-\lambda_0)]$$

where g is the mean value of gravity at the equator, and c, like β and β_1 is a dimensionless number.

gravity wave - A wave whose velocity of propagation is controlled primarily by gravity. Water waves of length greater than 2 in are considered gravity waves.

great circle - The line of intersection of the surface of a sphere and any plane which passes through the center of the sphere. The shortest distance between any two points on a sphere is along the arc or a great circle connecting the two point. Great circles on the celestial sphere which are given particular designations are the equator, the ecliptic, meridians, hour circles, prime verticals, colures, and horizons. The shortest distance on an curve except for the equator (a circle) and the meridians (ellipses). In cartography, the gnomonic is the only map projection on which a great circle is represented in all instances as a straight line.

greenhouse effect - 1. In the ocean where a layer of low salinity water overlies a layer of more dense water, the short wavelength radiation of the Sun is

absorbed in the deeper layers. The radiation given off by the water is in the far infrared and, since this cannot radiate through the low salinity layer, a temperature rise results in the deeper layers. 2. In the atmosphere, the same effect is produced by a layer of clouds, and the long wave radiation is trapped between the clouds and the Earth.

groin - A low artificial wall-like structure of durable material extending from the land to seaward for a particular purpose such as to protect the coast or to force a current to scour a channel.

ground check (base-line check) - 1. A procedure followed prior to the release of a radiosonde to obtain the temperature and humidity corrections for the radiosonde system. 2. Any instrumental check prior to the ground launch of an airborne experiment.

ground swell - A long high ocean swell; this swell rises to prominent height in shallow water, although usually not as high or dangerous as blind rollers.

ground zero - The point on the surface of land vertically below or above the center of a burst of a nuclear (or atomic) weapon; frequently abbreviated as GZ. For a burst over or underwater, the corresponding term is Surface Zero (SZ), a term which is also commonly used for ground surface and underground bursts.

group velocity waveguide - The velocity at which the energy spectrum is propagated parallel to the walls of the waveguide. Numerically less than the velocity of light; in the phenomena of waveguide propagation.

gust - 1. A rapid increase in the strength of the wind relative to the mean strength obtaining at the time. 2. A sudden brief increase in the speed of the wind that is of a more transient character than a squall and is followed by a lull or slackening in windspeed. Generally, winds are least gusty over large water surfaces and most gusty over rough land near high buildings. According to United States weather observing practice, gusts are reported when the peak windspeed between the peaks and lulls is at least 9 knots. The duration of a gust is usually less than 20 seconds. 3. With respect to turbulence resulting in increased structural stresses upon an aircraft, a sharp change in windspeed relative to the aircraft or a sudden increase in airspeed caused by fluctuations in the air flow. 4. An increase in windspeed of 10 knots or more that lasts for less than 1 minute.

gustsonde - An instrument dropped from high altitude and carried by a stable parachute which is used to measure the vertical component of turbulence aloft. Consists of an accelerometer and radio telemetering equipment.

- H -

half-life - The time required for the activity of a given radioactive species to decrease to half of its initial value because of radioactive decay. The half-life is a characteristic property of each radioactive species and is independent of its amount or condition. The effective half-life of a given isotope is the time in which the quantity in the body (or an organ) will decrease to half as a result of both radioactive decay and biological elimination. See biological half-life.

harmonic analysis - The resolution of a series of measurements (for example, a time series) into harmonic components or sine waves of which the periods are fixed in advance, but the phase and amplitude are determined from the data.

haze - a suspension of minute dry particles that reduces horizontal visibility.

headwind - Opposing wind, that is, wind which opposes the intended progress of an exposed moving object, thereby, rendering an airborne object's airspeed greater than its groundspeed; the opposite of a tailwind. This effect is particularly critical in air navigation, and it is of interest to note that wind direction may have no component opposing the intended course of an aircraft but because of drift effects may have a component opposing the aircraft's heading.

health physics - That science and art devoted to recognition, evaluation, and control of all health hazards from ionizing radiation.

heat - A form of energy, normally measured in calories or joules.

height of instrument (geodetic) - 1. In spirit leveling, the height of the line of sight of a leveling instrument above the adopted datum. 2. In stadia surveying, the height of the center of the telescope (horizontal axis) of transit or telescopic alidade above the ground or station mark. 3. In trigonometrical leveling, the height of the center of the theodolite (horizontal axis) above the ground or station mark.

Helmholtz instability - The hydrodynamic instability arising from a shear or discontinuity in current speed at the interface between two fluids in two dimensional flow.

high (meteorology) - An area of high pressure with reference to a maximum of atmospheric pressure in two dimensions (closed isobars) in the synoptic surface chart or a maximum of height (closed contours) in the constant

pressure chart. Since a high on the synoptic chart is always associated with anticyclonic circulation, the term is used interchangeably with anticyclone.

high tide - See high water.

high water (HW) (or high tide) - The highest limit of the surface water level reached by the rising tide. High water is caused by the astronomic tide-producing forces and/or the effects of meteorological conditions.

homogeneity - Statistics of turbulence which are invariant in space.

hot line - A line within a fallout pattern connecting points of largest exposure (dose) rates.

hot spot - A surface area of higher-than-average radioactivity. Also, a part of a fuel element surface that has become overheated.

hour angle - The angle between the plane of the hour circle passing through a celestial body and the plane of the celestial body and the plane of the celestial meridian. The hour angle is reckoned from the meridian (0 hours or 0°) westward through 24 hours (360°). It may be measured by the angle at the pole between an hour circle and the meridian or by the arc of the equator which is intercepted by those circles.

hour circle - Circle of declination. Any great circle on the celestial sphere whose plane is perpendicular to the plane of the celestial equator. The hour circle which contains the zenith is identical with the celestial meridian.

humidity - A measure of the water-vapor content of air; a system of moist air. 1. Absolute humidity is the ratio of the mass of water vapor present to the volume occupied by the mixture (that is, the density of the water vapor component, where it is also termed vapor density or vapor concentration). It is usually expressed in g m^{-3}, and it is not conservative with respect to adiabatic expansion or compression. 2. Relative humidity is the dimensionless ratio of the mass of water vapor to the total mass of the system at a given temperature; approximately equal to the mixing ratio. 3. The mixing ratio is the dimensionless ratio of the mass of water vapor to the mass of dry air at a given temperature. 4. The dew point is the temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content for saturation to occur. When this temperature is below 0 °C, it is known as the frost point. Alternatively, dew point is defined as the temperature at which the saturation vapor pressure of the parcel is equal to the actual vapor pressure of the contained water vapor. The dew point is a conservation property of air with respect to the process described but is not

conservative with respect to vertical adiabatic motions of air in the atmosphere. The wetbulb temperature is the temperature an air parcel assumes when cooled to a constant pressure. It is produced by the extraction from the parcel itself of the latent heat of vaporization required to evaporate the water. No heat crosses the parcel boundary in either direction.

hydrodynamic instability - The parcel or wave displacements in a moving fluid system governed by the fundamental equations of hydrodynamics to which the hydrostatic approximation may or may not apply.

hydrogen bomb (or weapon) - A term sometimes applied to nuclear weapons in which part of the explosive energy is obtained from nuclear fusion (or thermonuclear) reactions. See fusion, nuclear weapon, and thermonuclear.

hydrology - The scientific study of the waters of the Earth, especially with relation to the effects of precipitation and evaporation upon the occurrence and character of water in streams, lakes, and on or below the land surface.

hydrometeor - Any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the Earth's surface. Also, any water particles blown by the wind from the Earth's surface. Hydrometeors may be classified in a number of different ways: (1) liquid or solid water particles formed and remaining suspended in the air: damp haze, cloud, fog, ice fog, and mist; (2) liquid precipitation; drizzle and rain; (3) freezing precipitation; freezing drizzle, and freezing rain; (4) solid (frozen) precipitation; (5) falling particles that evaporate before reaching the ground: virga; (6) liquid or solid water particles lifted by the wind from the Earth's surface: drifting snow, blowing snow, blowing spray; and (7) liquid or solid water deposits on exposed objects: dew, hoarfrost, rime and glaze.

hydrophone - An electroacoustic transducer that responds to water-borne sound waves and delivers essentially equivalent electric waves.

hydrophone loss - As applied to a sonar transducer used for the reception of acoustic energy at a specified frequency; the transmission loss measured by the ratio of (1) the source power of the free-field acoustic energy available as plane sinusoidal waves from a water surface having an area of 1 square centimeter and lying perpendicular to the direction of the maximum response reference axis of the transducer at the point occupied by its effective center, and (2) the resulting output power of the electric energy available from the transducer.

hydrophotometer - An instrument used to measure the extinction coefficient or transmission of light in water. It consists of a constant light source placed at a specific distance from a photocell. When placed in the water, the electrical

output of the photocell is proportional to the amount of light striking the cell, which in turn depends upon the transparency of the water. The instrument is calibrated to read 100 percent light transmission in air.

hydrosphere - The water portion of the Earth as distinguished from the solid part, called the lithosphere, and from the gaseous outer envelope, called the atmosphere. See biosphere and geosphere.

hydrostatic equation - The form assumed by the vertical component of the vector equation of motion when all coriolis force, Earth curvature, frictional, and vertical acceleration terms are considered negligible compared with those involving the vertical pressure force and the force of gravity.

$$\frac{p}{z} = -pg$$

where p is the pressure, ρ the density and g the acceleration of gravity, and z the geometric height.

hydrostatic equilibrium - The state of a fluid whose surfaces of constant pressure and constant mass or density coincide and are horizontal throughout. Complete balance exists between the force of gravity and the pressure force. The relation between the pressure and geometric height is given by the hydrostatic equation. The analysis of atmospheric stability has been developed to a high degree atmosphere in hydrostatic equilibrium.

hydrostatic pressure - The pressure at a given depth caused by the weight of water column above that depth.

hygrometer - An instrument which measures the water vapor content of the atmosphere. There are six basically different means of transduction used in measuring this quantity and equal number of types of hygrometers. They include (1) the psychometer, which utilizes the thermodynamic method; (2) instruments which depend on a change of physical dimensions caused by the absorption of moisture; (3) instruments which depend upon condensation of moisture; (4) instruments which depend upon the diffusion of water vapor through a porous membrane; (5) instruments which depend on the measurements of the absorption spectra of water vapor; and (6) instruments which depend upon the change of chemical or electrical properties caused by the absorption of moisture.

hypsometer - Literally, an instrument for measuring height; specifically, an instrument for measuring atmospheric pressure by determining the boiling point of a liquid at the station. The relationship between the boiling point of a liquid and atmospheric pressure is given by the Clapeyron-Clausius

equation. The sensitivity of the hypsometer increases with decreasing pressure, making it more useful for high-altitude work. Consequently, hypsometers are frequently used for height estimation.

identification, target - In the target acquisition cycle, an object described to the limit of the observer's knowledge.

ice fog - A suspension of minute ice crystals that reduces horizontal visibility.

illuminance - 1. The total luminous flux received on a unit area of a given real or imaginary surface. 2. The total luminous flux received on a unit area of a given real or imaginary surface, expressed in such units as the footcandle, lux, or phot. Illuminance is analogous to irradiance but refers only to light and is the source of luminance of a nonluminous surface.

illumination, ground - The luminous flux falling on a unit area of the ground from the Sun, sky,and Moon. Typical units include lumens per square meter.

illumination level - The amount of illumination falling upon a target/background scene. The amount depends mainly on the time of day, the degree of cloud cover and the presence or absence of shadow.

image intensifier (image amplifier) - A device designed to amplify the brightness of visual displays through electrical methods.

imaging infrared (IIR or I^2R) - A sensor which operates at infrared wavelengths and the accompanying display system which depicts a scene based on the sensor's data.

impact predictor - A device which can determine, in real time, the point on the Earth's surface where a ballistic missile will impact if thrust is instantaneously terminated.

implosion weapon - A device in which a quantity of fissionable material less than a critical mass has its volume suddenly decreased by compression so that it becomes supercritical and an explosion can take place. Compression is achieved by means of a spherical arrangement of specially fabricated shapes of ordinary high explosive which produce an inwardly directed implosion wave. The fissionable material is at the center of the sphere.

inaccuracy - The difference between the input quantity applied to a measuring instrument and the output quantity indicated by that instrument. The inaccuracy of an instrument is equal to the sum of its error and its uncertainty.

inactive front - A front or portion of, which produces very little cloudiness and no precipitation as opposed to an active front or passive front.

incident overpressure - In acoustics, the free air overpressure before any amplification caused by reflections.

index of refraction - 1. As applied to some substances, the dimensionless ratio of the wavelength of phase velocity of an electromagnetic wave in a vacuum to that in the substance. In air, a function of a wavelength and density. A convenient expression in common use is the refractivity N = 10 to the sixth power times (n - 1), where n is the index of refraction. For a mean atmosphere, n decreases exponentially with height, and a wavefront proceeding away from the Earth's surface and nonvertically through the atmosphere will be refracted downward toward the Earth, but not as fast as the Earth's surface falls away from the plane tangent to the point of the Earth at the origin of the wave. In the actual atmosphere, refraction does not necessarily vary exponentially with height and must be measured. Sometimes superrefractivity occurs, bending the wavefront more than normally until it moves parallel to the Earth's surface. Such "ducting" occurs at vertical N gradients greater that 157 N-units per kilometer, extending the horizons of radar, television, and some other EO systems. 2. At optical frequencies, the refractive index is a function of the air density and thus of pressure and temperature. At microwave frequencies this index depends also upon the density of such polar molecules as water and carbon dioxide; that is., upon partial vapor pressures. Short-term refractivity fluctuations in the mid-latitude lower troposphere are caused primarily by vapor pressure variations. For example, a rise of only 0.2 mb in vapor pressure can increase the refractivity by 1 N-unit, whereas a rise of 4 mb in total pressure or a decrease of 1° in temperature is required to produce the same refractivity change.

induced radioactivity - Radioactivity produced in certain materials as a result of nuclear reactions, particularly the capture of neutrons which are accompanied by the formation of unstable (radioactive) nuclei. In a nuclear explosion, neutrons can induce radioactivity in the weapons materials as well as in surrounding materials (for example, by interaction with nitrogen in the air and with sodium, manganese, aluminum, and silicon in the soil and seawater).

inertial subrange - The region of a spectrum between the energy input and the viscous dissipation scales.

infant thyroid dose - The amount of radiation detected in an infant's thyroid gland from the ingestion of cow's milk contaminated with radioactive I-131.

Cow's milk contamination results from cows eating green or dried feed upon which I-131 has been deposited.

infinite deposition dose - The external gamma radiation dose accumulated by a receptor placed in a fallout area immediately after the end of cloud passage and left there for an infinite time.

infrared radiation (longwave radiation or infrared) - 1. Electromagnetic radiation lying in the wavelength interval from about 0.8 um to an indefinite upper boundary sometimes arbitrarily set at 67 1,000 um (0.01 centimeter). At the lower limit of this interval, the infrared radiation spectrum is bounded by visible radiation, while on its upper limit it is bounded by microwave radiation of the type important in radar technology. 2. Electromagnetic radiation in the approximate wavelength range from about 0.7 to 1,000 um; 52 percent of the total solar radiation intensity is contained within this range of wavelengths. The amount at wavelengths greater than 4 um being very small.

initial angle - The angle that a sound ray leaving a sound source makes with a horizontal plane.

initial range - The horizontal distance between the source and the closest point of the reswept (convergence) zone.

injection temperature - 1. The temperature of the seawater as measured at the seawater intakes in the engine room of a ship. 2. Because the injectors are commonly located well below the surface and because the temperature may be influenced by the heat of the engines or boilers, injection temperature is not considered as reliable as bucket temperature for sea surface temperature. 3. Electronic temperature probes (surtems) have been developed to improve this procedure.

in situ - A Latin term meaning in place; in the natural or original position.

insolation - 1. Solar radiation received at the Earth's surface. Also, the rate at which direct solar radiation is incident upon a unit horizontal surface at any point on or above the surface of the Earth. 2. (contracted from incoming solar radiation). In general, solar radiation received at the Earth's surface. 3. The rate at which direct solar radiation is incident upon a unit horizontal surface at any point on or above the surface of the Earth.

intensity - 1. A measure of the radiant flux per unit solid angle emanating from the source. 2. The amount of energy of any radiation incident on (or flowing through) a unit area perpendicular to the radiation beam in the unit time. The intensity of thermal radiation is generally expressed in calories per

square centimeter per second falling on a given surface at any specified instant. As applied to nuclear radiation, the term intensity is sometimes used rather loosely to express the exposure (dose) rate at a given location. 3. In general, the degree or amount usually expressed by the elemental time rate or spatial distribution of some condition or physical quantity such as rainfall, electric field, and sound.

intensity level - Expressed in decibels, a sound level 10 times the logarithm to the base of 10 of the ratio of the intensity of this sound to the reference intensity. The reference intensity shall be stated explicitly.

intensity luminous - The luminous flux per unit solid angle of a point source of radiation at visible wavelengths which has been adjusted to take into account the variable response of the human eye as a function of the wavelength of light.

interdiction - The act of preventing or hindering, by any means, the enemy use of an area or route.

internal wave - 1. A wave that occurs within a fluid whose density changes with a depth either abruptly at a sharp surface of discontinuity (an interface) or gradually. Its amplitude is greatest at the density discontinuity or, in the case of gradual density change, somewhere in the interior of the fluid and not at the free upper surface where the surface waves have their maximum amplitude. 2. Because of the small density gradient involved compared to that at the surface, a relatively small amount of energy is required to set up and maintain an interval wave. Wave heights, periods, and lengths are usually large as compared to surface waves.

international synoptic code - A synoptic code approved by the World Meteorological Organization in which the observable meteorological elements are encoded and transmitted in "words" of five numerical digits length.

intertidal zone (or littoral zone) - Generally considered to be the zone between mean high water and mean low water levels.

inversion (meteorology) - A departure from the usual decrease or increase with altitude of the value of an atmospheric property; the layer through which this departure is found (the inversion layer) or the lowest altitude at which the departure was found (the base of the inversion). This term almost always means a temperature inversion; however, a moisture inversion and precipitation inversion are also so defined.

inversion (or temperature inversion) - A condition which occurs at a point or through a layer where temperature increases with increasing height. Such a feature is an inversion of the condition of a positive lapse of temperature.

ion - An atom or molecule that has lost or gained one or more electrons. By such ionization it becomes electrically charged. An example is an alpha particle.

ion cloud - An inhomogeneity or patch of unusually great ion density in one of the regular regions of the ionosphere. Such patches occur quite often in the E-region, and are then called sporadic E-layers.

ionization - The process of adding electrons to or knocking electrons from atoms or molecules, thereby, creating ions. High temperatures, electrical discharges, and nuclear radiation can cause ionization.

ionizing radiation - Electromagnetic radiation (gamma or X-rays) or particulate radiation (alphas particles, beta particles, and neutrons) capable of producing ions (that is, electrically charged particles) directly or indirectly in its passage from matter. See nuclear radiation.

ionosphere - The atmospheric shell characterized by high ion density. Its base is at about 70 or 80 km and it extends to an indefinite height. The ionosphere is classically subdivided into layers. Each layer, except for the D-layer, is supposedly characterized by a more or less regular maximum of electron density. The lowest clearly defined layer is the E-layer occurring between 100 and 120 km. The F_1-layer and the F_2-layer occur in the general region between 150 and 300 km. The F_2-layer is always present and has the higher electron density. The existence of a G-layer has been suggested but is questionable. The portions of the ionosphere in which these layers tend to form are known as ionospheric regions. The assumption that the ionosphere is stratified in the vertical into discrete layers is currently under serious question. Some evidence supports a belief that ion clouds are the basic elements of the ionosphere. Other investigations appear to reveal the ionosphere as a general ionized region characterized by more or less random fluctuations of electron density.

irradiance - The total radiant flux received on a unit area of a given real or imaginary surface; the flux density of electromagnetic radiation as distinguished from illuminance. Also called radiant flux density, irradiation, and specific irradiation.

irradiation - See irradiance.

isobar - A line of equal or constant pressure; an isopleth of pressure. In meteorology, most often refers to a line drawn through all points of equal

atmospheric pressure along a given reference surface such as a constant-height surface (notably mean sea level on surface charts), an isentropic surface, the vertical plane, or a synoptic cross section. The pattern of isobars has always been a main feature of surface-chart analysis.

isobars - Nuclides having the same mass number but different atomic numbers.

isogon - A line on some given surface joining all points having the same direction of a particular vector quantity. In meteorology, isogons are usually drawn for the velocity vector as an aid in constructing streamlines for a wind field.

isopleth - 1. In common meteorological usage, a line of equal or constant value of a given quantity with respect to either space or time; same as isogram. 2. More specifically, a line drawn through points on a graph at which a given quantity has a specified constant value.

isopycnic - 1. Of equal or constant density with respect to either space or time; equivalent to an isostere. 2. A line on a chart connecting all points of equal or constant density; an isopleth of density. 3. Short form for isopycnic line.

isotach - A line in a given surface connecting points with equal wind speed; isovel; isokinetic.

isotope - Atoms with the same atomic number (same chemical element) but different atomic weights. An equivalent statement: nuclei having the same number of protons but different numbers of neutrons. Thus ${}_6C^{12}$, ${}_6C^{13}$, and ${}_6C^{14}$ are isotopes of the element carbon. The subscripts denote their common atomic numbers, and the superscripts denote the varying atomic weights.

isotropic - 1. In general, pertaining to the state in which a quantity and/or spatial derivatives are independent of direction. 2. Pertaining to a state of electromagnetic radiation in which the intensity is the same in all directions.

iterate (computer) - To repeatedly execute a loop or series of steps; for example, a loop in a routine.

ivory point - A small pointer extending downward from the top of the cistern of a Fortin barometer. The level of the mercury in the cistern is adjusted so that it just comes in contact with the end of the pointer, thus setting the zero of the barometer scale.

jet stream - Relatively strong winds concentrated within a narrow stream in the atmosphere. While this term may be applied to any such stream regardless of direction, including vertical, it is coming more and more to mean only a quasihorizontal jet stream of maximum winds imbedded in the mid-latitude westerlies and concentrated in the high troposphere. The question of the maintenance of the jet stream is a cardinal problem of theoretical meteorology. Two such jet streams are sometimes distinguished. The predominant one, the polar-front jet stream, is associated with the polar front of the middle and upper-middle latitudes. Very loosely, it may be said to extend around the hemisphere, but like the polar front, it is discontinuous and varies greatly from day to day. A subtropical jet stream is found at some longitudes between 20 and 30° latitude and is strongest off the Asian coast. Currently, in the analysis of upper-level charts, a jet stream is indicated whenever it is reliably determined that the wind speed equals or exceeds 50 knots.

Karman's constant - A nondimensional quantity (k) in the equation which defines the nature of the wind structure in the low atmosphere in adiabatic lapse rate conditions.

Kelvin temperature scale (K) - Absolute temperature scale, thermodynamic temperature scale. An absolute temperature scale independent of the thermometric properties of the working substance. On this scale, the difference between two temperatures T_1 and T_2 is proportional to the heat converted into mechanical work by a Carnot engine operating between the isotherms and adiabats through T_1 and T_2. A gas thermometer using a perfect gas has the same temperature scale. For convenience, the Kelvin degree is considered identical to centigrade degree. The ice point is 273.16 K.

kilometer (km) - The unit of distance measurement in the metric system equal to 0.62 statute mile or 0.54 nautical mile. A statute mile equals 1.61 kilometers while a nautical mile equals 1.85 kilometers.

kilopascals (kPa) - A unit of pressure convenient for reporting atmospheric pressures. Mean sea level pressure is 101.32 kPa. One kPa is equivalent to 10 millibars (mb).

kiloton energy - Defined strictly as $^{-}10^{12}$ calories (or 4.2×10^{12} ergs). This amount of energy is approximately what would be released by the explosion of a kiloton (1,000 tons) of TNT.

kinematic viscosity - The ratio of dynamic viscosity to fluid density.

Kolmogoroff's similarity hypothesis - A statement of the factors determining the transfer and dissipation of kinetic energy. Kolmogoroff considers large anisotropic eddies as the source of energy which is transferred down the size scale. At the same time, the eddies lose all structure; they become homogenous and isotropic (that is, similar). In this region, their energy is determined only by the rate of transfer from the larger eddies and the rate of dissipation by the smaller eddies. Kolmogoroff stated two similar hypothesis. (1) At large Reynolds numbers, the local average properties of the small-scale components of any turbulent motion are determined entirely by the kinematic viscosity and average rate of dissipation per unit mass. (2) There is an upper subrange (inertia subrange) in this bandwidth of small eddies in which the local average properties are determined only by the rate of dissipation per unit mass. It is a consequence of these hypothesis that in the inertial subrange the energy is partitioned among the eddies in the proportion to $K^{-(5/3)}$ where K is the wave number.

lagrangian system - A system of coordinates by which fluid parcels are identified for all time by assigning coordinates which do not vary with time.

laminar boundary layer - A very shallow layer of air adjacent to a fixed boundary in which the air velocity increases very rapidly but fairly regularly from the boundary of the free airstream.

laminar flow - Particles of a fluid following a relatively smooth path; the only random disturbances are the infinitesimal fluctuations caused by molecular agitation.

laminar sublayer - The laminar boundary layer underlying a turbulent boundary layer.

lapse rate - The decrease of an atmospheric variable with height, the variable being temperature unless otherwise specified. Since this term applies ambiguously to the environmental lapse rate and the process lapse rate, its meaning must often be ascertained from the context.

laser - An acronym for Light Amplified by Stimulated Emitted Radiation. The coherent, collimated beam of electromagnetic radiation that is produced when stimulation radiation excites the molecular structure of a material.

lateral direction - Fluid flow which is perpendicular to the mean flow.

layer (meteorology) - An array of clouds or obscuring phenomena aloft whose bases are at approximately the same level.

layer depth (or isothermal layer depth, mixed layer depth) - In oceanography, the thickness of the mixed layer or the depth to the top of the thermocline.

layer depth effect - The weakening of the sound beam owing to abnormal spreading as it passes from an isotherm or a positive gradient to an underlying negative layer.

least squares - A mathematical method of determining the most probable values of a series of quantities from a set of observations greater in number than are necessary to determine those quantities. This method rests upon the mathematical demonstration that where each value is of the same quantity as the others, the most probable value of quantity is the one for which the sum of the squares of the residual errors (or corrections) is a minimum. If the observations are of unequal weight, the most probable value is the one for

which the sum of the squares of the weighted residuals is a minimum. In data reduction, this is a method used to obtain the most probable values of position and associated data, while at the same time fully coordinating and correlating those data. Least squares have also been designated as minimum squares.

lee - Shelter or the part or side sheltered or turned away from the wind or waves.

leeward - The direction toward which the wind is blowing; the direction toward which waves are traveling.

lethal dose - A dose of ionizing radiation sufficient to cause death. Median lethal dose (MLD, LD_{50}) is the dose required to kill half of the individuals in a large group similarly exposed within a specified period of time. The MLD for a man is about 400 roentgens.

light detection and ranging (lidar) - A laser generating a short, powerful light pulse which propagates through the atmosphere. Used to measure the intensity and phase shift of backscattered light.

limit of the atmosphere - The level at which the atmospheric density becomes the same as the density of interplanetary space (generally accepted as about one particle per cubic centimeter). Also, the altitude where a molecule of air ceases to be held in free paths which are segments of Earth orbits.

liquid water content - The amount of liquid water present in a volume of air, snow, or soil.

lithosphere - The outer, solid portion of the Earth; the crust of the Earth. Usually used in contexts wherein the lithosphere is said to make contact with the atmosphere and hydrosphere. See also biosphere and geosphere.

littoral (or interidal) - The benthic zone is between high and low water marks. According to some authorities, the benthonic zone is between the shore and water depths of approximately 100 fathoms (200 meter). Also called the littoral benthal which is subdivided into the eulittoral and the sublittoral. The usage and interpretation of this term varies widely in the literature.

littoral current - A current caused by wave action that sets parallel to the shore, usually in the nearshore region within the breaker zone.

longitudinal direction - Fluid flow which is along the mean flow. When the baroswitch pen passes each fifth contact of the commutator up to a number determined by the design of the commutator, it then signals every contact except the fifth, which is transmitted as a hi-reference signal.

low, depression (meteorology) - An area of low pressure referring to a minimum of atmospheric pressure in two dimensions (closed isobars) on a constant-height chart or a minimum of height (closed contours) on a constant-pressure chart. Since a low on a synoptic chart is always associated with cyclonic circulation, the term is used interchangeably with cyclone.

lower atmosphere - Generally, that part of the atmosphere in which most weather phenomena occur (that is, the troposphere and lower stratosphere). Used in contrast to the common meaning for lower atmosphere. In other contexts, the term implies the upper troposphere.

look angle, sensor - The angle formed by the line of sight of the sensor and the horizontal plane.

looming - An apparent elevation of distant terrestrial objects caused by abnormal atmospheric refraction. Because of looming, objects below the horizon are sometimes visible. The opposite is sinking.

low-reference signal (meteorology) - The audio-frequency signal transmitted by a radiosonde.

low light level TV (LLLTV) - A television sensor system which views visible and very near IR wavelengths. Target-to-background contrasts are usually enhanced in the very near IR. The LLLTV possesses a photomultiplication capability which allows it to operate under low light level conditions like moonlit nights.

low tide - See low water.

low water (LW) - Low tide; the lowest limit of the surface water level reached by the lowering tide. Low water is caused by the astronomic tide-producing forces and/or the effects of meteorological conditions.

lunar tide - That part of the tide caused solely by the tide-producing forces of the Moon as distinguished from that part caused by the forces of the Sun.

lumen - A unit of luminous flux. Equal to the luminous flux radiated into a unit of solid angle (steradian) from a small source having the luminous intensity of one candle.

luminance - The photometric term corresponding to radiance; specifies the amount of power radiated from an extended body per solid angle and per projected areas of radiating surface; expressed in lumens per steradian per square meter or candle per square meter.

luminance, path - The amount of luminous flux scattered into the line of sight of an observer or emitted along a path.

luminance, sky - The luminance of the sky at the horizon as measured in the same direction (azimuth) as the observer's line of sight.

luminous - Pertaining to the emission of visible radiation.

lux - An illuminance. 1 lumen incident per square meter (IS unit).

macroviscosity - A quantity with the dimensions of kinematic viscosity defined as $u^* z_0$, where u^* is the friction velocity and z_0 is the roughness length.

magnetosphere - 1. The predominantly dipole geomagnetic field which is compressed by the solar wind (see solar plasma) on the Earth's day side and dragged out on its night side to form a long magnetic tail. In this region of space, the geomagnetic field dominates the motion of charged particles. In its inner boundary is the top of the ionospheric E-regional (about 140-km altitude). Its outer boundary, the magnetopause, marks the transition to the interplanetary medium where the geomagnetic field is effectively terminated by streams of low energy solar particles. The latter occurs on the sunward side at an average distance of about 10 R_e (Earth radii) or about 64,000 km. This distance may vary from 6 to 14 R_e, while along the dawn and dusk meridians and over the poles, it is about 15 R_e. The magnetic tail, termed the magnetotail, is extremely long; it varies in length from a few hundred to a few thousand R_e. At the distance of the Moon, its diameter is some 20 R_e. 2. The Earth's neighborhood is full of particles of differing charges and energies. In most instances, there are concentrations of these in inner and outer energy bands. The most prominent are those first detected, the Van Allen radiation belts. These toroidal belts of charged particles surround the Earth near its equator. The particle density dependence on altitude in these belts is roughly inversely proportional to the atmospheric density up to altitudes of a few thousand km. There are two such belts: the inner belt (protons > 30 mev, electrons > 40 kev) extends to about 45° north and south geomagnetic latitudes and from about 800 to about 8000 km in altitude. The outer belt consists of generally lower energy particles and fluctuates in size and intensity with solar activity but is at about 4 R_e. It is symmetrical about the equator and extends to about 70° geomagnetic latitude north and south and to altitudes as high as 130,000 km. The maximum particle density, however, is in the inner belt where the high energy trapped radiation, though most intense during the solar cycle minimum, is relatively stable with time. It is this belt which is hazardous to manned and unmanned satellite systems.

main body of turbulent fluid - Fluid found above the laminar boundary where viscosity is negligible.

mandatory level; mandatory surface - One of several constant-pressure levels in the atmosphere for which a complete evaluation of data derived from upper-air observations is required. The radiosonde code has specific blocks reserved for this data. To have a more complete vertical picture, significant levels of radiosonde observations are also evaluated.

map projection - 1. An orderly system of lines on a plane representing a datum surface. Also, the mathematical concept of such a system. Map projections are classified according to the characteristics which they preserve (for example, conformal, equal area, and azimuthal) according to the methods used in their development (for example, polyconic, gnomonic, and stereographic) and according to the names of their authors often coupled with some characteristic (for example, Mercator, Bonne, Lambert with two standard parallels). The following map projections are defined under their particular designations. 2. (Aitoff equal-area) A Lambert equal-area azimuth projection of a hemisphere converted into a map projection of the entire sphere by a manipulation suggested by Aitoff. A projection bounded by an ellipse in which the line representing the equator (major axis) is doubled the length of the line representing the central meridian (minor axis).
3. (Albers conical equal-area) An equal-area map projection of the so- called conical type wherein geographic meridians are represented by straight lines which meet at a common point. This point serves as the center of a series of arcs of circles which represent geographic parallels. Meridians and parallels intersect at right angles. Along two selected parallels, called standard parallels, the scale is held exact. Along the other parallels, the scale varies with the latitude but is constant along any given parallel. Between standard parallels, the meridional scale is too great; beyond them, too small. At any point on the projection, the departure from exact scale along a parallel is the opposite sign from the departure from exact scale along the meridian, and the two are so related as to produce an equal-area map projection. Passing through every point are two lines of true -length scale called isoperimetric curves which intersect in right angles. This projection was devised by Dr. H. C. Albers in 1805. 4. (aphylactic) A map projection which is neither a conformal map nor an equal-area map projection but contains elements of both. 5. (authalic) An equal-area map projection. 6. (azimuthal; zenithal) A map projection on which the azimuth or directions off all lines radiating from a central point or pole are the same as the azimuths or directions of the corresponding lines on the sphere. As a class, azimuth map projections include a number of special projections which are described under their particular designations. An azimuthal map projection may be constructed having two poles or points, lines from which are shown in correct azimuth. Such a projection is termed a doubly azimuthal map projection.
7. (azimuthal equidistant) An azimuthal map projection on which straight lines radiating from the center or pole of a projection represent great circles in their true azimuths from that center with the lengths along those lines being of exact scale. This projection is neither equal-area nor conformal.
8. (Bonne) A modified equal-area map projection of the so-called conical type, having lines representing a standard parallel and a central meridian intersecting near the center of the map. The line representing the central geographic meridian is straight and the scale along it is exact. All geographic parallels are represented by arcs of concentric circles at their true distances

apart, divided to exact scale, and all meridians except the central are curved lines connecting corresponding points on the parallels. This projection is strictly equal area. A particular form of this projection is the Sanson-Flamsteed or sinusoidal map projection, For these constructions, the equator is used as the standard parallel. 9. (Lambert conformal conic) A conformal map projection of the so-called conical type whose geographical meridians are represented by straight lines which meet in a common point outside the limits of the map and whose geographic parallels are represented by a series of arcs of circles having this common point for a center. Meridians and parallels intersect in right angles, and angles on the Earth are correctly represented on the projection. This projection may have one standard parallel along which the scale is held exact or there may be two such standard parallels, both maintaining exact scale. At any point on the map, the scale is the same in every direction. It changes along the meridians and is constant along each parallel. Where there are two standard parallels, the scale between those parallels is too small; beyond them, too large. The Lambert conformal conic map projection with two standard parallels is the base for the coordinate systems devised by the United States Coast and Geodetic Survey for zones of limited north-south dimension and indefinite east-west dimension. In those systems, the standard parallels are placed at distances of one-sixth the north-south width of the map from its upper and lower limits. 10. (mercator) A conformal map projection of the so-called cylindrical type. The equator is represented by a straight line true to scale. The geographic meridians are represented by parallel straight lines perpendicular to the line representing the equator and are spaced according to their distance apart at the equator. The geographic parallels are represented by a second system of straight lines perpendicular to the family of lines representing the meridians and are; therefore, parallel with the equator. Conformality is achieved by mathematical analysis. The spacing of the parallels being increased with increasing distance from the equator to conform with the expanding scale along the parallels resulting from the meridians being represented by parallel lines. 11. (polyconic) A map projection having the central geographic meridian represented by a straight line, along with the spacing for lines representing the geographic parallels is proportional to the distance apart of the parallels. The parallels are represented by arcs of circles which are not concentric, but whose centers lie on the line representing the central meridian, and whose radii are determined by the lengths of the elements of cones which are tangent along the parallels. All meridians except the central one are curved. Although this projection is neither conformal nor equal area, it has been much used for maps of small areas because of the ease with which it can be constructed. It is the map projection used for the Topographic Map of the United States Geological Survey and in a modified form is used for maps of large areas. It was devised by Mr. F. R. Hassler, organizer and first superintendent of the United States Coast Survey (now the United States Coast and Geodetic

Survey). 12. (transverse mercator) A map projection of the so-called cylindrical type equivalent in principle to the regular Mercator projection turned (transversed) 90^0 in azimuth. In this projection the central meridian is represented by a straight line corresponding to the line which represents the equator on the regular Mercator map projection. Neither the geographic meridians, except the central meridian, nor the geodetic parallels (except the equator, if shown) are represented by straight lines. It is a conformal projection and is the state plane-coordinate systems for the grids of those zones whose greater dimension is in a north-south direction.

map scale - The relationship which exists between a distance on a map and the corresponding distance on the Earth. A map scale may be expressed as an equivalence, as a numerical fraction or ratio, or shown graphically. On large-scale maps, the distance on the Earth is on a designated datum (that is, sea or ground level).

map, topographic - A map which represents the horizontal and vertical positions of the features represented; distinguished from a planimetric map by the addition of relief measurable form. A topographic map usually shows the same features as a planimetric map but uses contours or comparable symbols to show mountains, valleys and plains, and in the case of hydrographic charts, uses symbols and numbers to show depths in bodies of water.

marine climate (or maritime climate, oceanic climate) - 1. A regional climate which is under the predominant influence of the sea (that is, a climate characterized by oceanicity); the antithesis of a continental climate. 2. Such a climate is found where the prevailing winds blow onshore as on oceanic islands and on the western coasts of the continents in the middle latitudes. Such a climate extends inland either until it meets a climatic divide or, in level country, until it becomes modified and gradually attains greater continentality. A marine climate is characterized by small diurnal and annual ranges of temperature with retardation of the annual extremes one to two months after each solstice.

marine ecology - The science which embraces all aspects of the interrelations of marine organisms and their environment and the interrelations between the organisms themselves.

marine meteorology - 1. That part of meteorology which deals mainly with oceanic areas including island and coastal regions. In particular, it serves the practical needs of surface and air navigation over the oceans. 2. Since there is a close interaction between ocean and atmosphere, and oceanic influences upon weather and climate can be traced far inland over the continents, modern meteorology uses this name mainly for making regional or administrative distinctions.

maritime air - A type of air whose characteristics are developed over an extensive water surface and which has the basic maritime quality of high moisture content in at least its lower levels.

maser - See microwave amplification simulated emission of radiation.

mass number - The sum of the neutrons and protons in a nucleus. The nearest whole number to the atom's actual atomic weight (for example, the mass number of uranium-235 is 235).

mass transportation - The transfer of water from one region to another originating from the orbital motion of waves. See nearshore current system.

mass transportation speed - The speed of the current originating from waves.

maximum permissible concentration - That amount of radioactive material in air, water, and foodstuffs competent authorities have established as the maximum that would not create undue risk to human health. See radioactivity concentration guide.

maximum permissible dose - That dose of ionizing radiation which competent authorities have established as the maximum that can be absorbed without undue risk to human health. See radiation protection guide.

mean free path - The average distance traveled by a particle, photon, atom, or molecule between successive collisions.

mean high or low water - The mean height of all high or low waters at a particular point or station over a considerable period of time. For tidal waters, the cycle of change covers a period of about 18.6 years, and the mean high or low water is the mean of all high or low waters for that period. For any body of water, it is the mean of all high or low waters over a period of time of such length that increasing its length does not appreciably change the mean.

mean sea level - The average height of the sea for all stages of the tide. Mean sea level is obtained by averaging the observed hourly heights of the sea on the open coast or in adjacent waters having free access to the sea. The average is taken over a considerable period of time.

mean tide level (MTL) (or half tide level, ordinary tide level.) - The reference plane between mean high water and mean low water.

mean transport speed - The speed at which a radioactive cloud is transported by the winds. Derived by dividing the wind vector sum from a hodograph by the number of 1000-foot layers in the cloud.

meridional wind - The wind or component along the local meridian as distinguished from zonal wind. In a coordinate system fixed locally with the x- axis directed eastward and the y-axis directed northward, the meridional wind is positive if from the south and negative if from the north.

mesopause - The top of the mesosphere; corresponds to the level of minimum temperature at about 70 to 80 km.

mesosphere - The atmospheric shell between about 55 and 70 or 80 km, extending from the top of the stratopause to the upper temperature minimum (the mesopause). Characterized by a decreasing temperature ranging from approximately 90° at the mesopause.

messenger - A cylindrical metal weight approximately 3 inches long and 1 inch in diameter which is usually hinged with a latch and attached around an oceanographic wire. Used to actuate the tripping mechanism on oceanographic devices such as Nansen bottles and current meters after they have been lowered to the desired depth.

meteor - A general term for any atmospheric phenomenon including hydrometers (rain, cloud, fog, and mist) and lithometers (atmospheric dust or salt particles). The term now is usually restricted to astronomical meteors which are bodies traveling through interplanetary space whose remnants occasionally reach the Earth's surface as meteorites.

meteorological range - Also known as the standard visibility, this quantity represents an early attempt to establish an instrumental equivalent to daytime sensory measurements of the Visual Range (q.v.). It follows theoretical work of the 1920s in assuming a constant threshold contrast of 0.02 and is thus a function only of the atmosphere's extinction coefficient. Numerically equal to the product of the natural log of 50 and the reciprocal of the extinction coefficient.

meteorological rocket; rocketsonde - A rocket designed primarily for routine upper-air observations (as opposed to research) in the lower 100 km of the atmosphere, especially that portion inaccessible to balloons (that is, altitudes above 30 km).

meteorological tide - A change in water level attributed to such meteorological conditions as wind and barometric pressure.

meter; metre - 1. A unit of length equivalent in the United States to exactly 39.37 inches. The meter was originally defined (1791) as the equivalent of one ten-millionth of the length of the quadrant of the meridian through Paris (from the equator to the north pole). A unit derived by this proportion from several arcs of triangulation became known as the French legal meter. The standard constructed to represent it was known as the Metre des Archives. Under an International Convention in 1875, the international meter was derived from the Metre des Archives, and the International Prototype Meter was adopted as a standard by the subscribing governments. Copies of this new standard in the same form as the original were furnished the governments which subscribed to the Convention of 1875. The United States received two such copies in 1889, one of which was adopted as the national standard of length, and is known as the National Prototype Meter. These two copies are in the custody of the National Bureau of Standards, Washington, D.C. The equivalent, 1 meter equals exactly 39.37 inches, was prescribed by an Act of Congress in 1886. At the Seventh General (International) Conference on Weights and Measures, Paris, 1927, the following supplementary value of the meter was temporarily adopted: 1 meter = 1,553,164.13 wavelengths of the red ray of Cadmium vapor in dry air at a temperature of 15^0 at a pressure of 760 mm of mercury and under normal conditions of gravity. 2. The basic unit of length of the metric system is equal to 1,650,763.73 wavelengths of kr^{86} orange-red radiation. On October 14, 1960, the 11^{th} General Conference on Weights and Measures adopted this standard to replace the platinum-iridium meter bar which had been kept in Paris as the international standard of lengths since 1889 under the Treaty of the Meter. 3. A device for measuring and usually indicating some quantity.

metrocket - A rocket system used for meteorological observations in the lower 100 km of the atmosphere, especially in that portion above 30 km inaccessible to rawinsonde. The metrocket motor propels the payload to apogee where an expulsion device ejects sensors into the atmosphere.

micrometeorology - The portion of the science of meteorology that deals with the observation and explanation of the smallest scale physical and dynamical occurrences within the surface boundary layer.

micrometer (μm) - One millionth of a meter.

micron (μ) - See micrometer.

microwave amplification by stimulated emission of radiation (maser) - A solid state amplifier operating at near absolute zero which derives amplification power from an auxiliary microwave power source. The

auxiliary microwave power source is used to excite molecules to a higher energy level. Over-populated intermediate energy levels give energy to the correct signal frequency resulting in amplification of the input signal.

mil - 1. A unit of angular measurement equal to 1/6400 of the circumference of a circle. 2. In artillery, the angle subtended by a tangential distance of 1 yard at a radial distance of 1000 years.

mile, nautical - Used in ocean navigation. The United States nautical mile is defined as equal to one-sixtieth of a degree of a great circle on a sphere whose surface is equal to the surface of the Earth. Its value, calculated for the Clark spheroid of 1886, is 1853.248 meters (6,080.20 feet). The international nautical mile is 1.852 meters (6076.10 feet). The United States nautical mile, also called a sea mile or a geographical mile, may be taken as equal to the length of a minute of arc along the equator or a minute of latitude on the map which is being measured.

military oceanography - The study of those specific characteristics and phenomena of the deep sea environment which may influence the design and performance of ships, equipment, or weapons.

millibar - A pressure unit of 1000 dynes per $cm^{2;}$ convenient for reporting atmospheric pressures. One millibar (mb) is equal to 100 pascals (Pa) or 0.1 kilopascal (kPa).

mixed layer - The layer of the water which is mixed through wave action or thermohaline convection.

mixed layer depth - The depth of the bottom of the mixed layer.

mixing height - The height above the ground to which there is high relative turbulent mixing.

mixing length - A mean mixing length of travel, characteristic of a particular motion over which an eddy maintains its identity; analogous to the mean free path of a molecule.

mixing length (for an eddy) - The distance which an eddy moves from its point of departure from the mean motion until it mixes again with the main body of the fluid. A measure of the average "size" of eddies responsible for the mixing and; therefore, a rough indication of the average depth of the layers over which mixing takes place.

mixing ratio - In a system of moist air, the dimensionless ratio of the mass of water vapor to the mass of dry air. For many purposes, the mixing ration

may be approximated by the specific humidity. In terms of pressure p and vapor pressure e, the mixing w is $w = \frac{0.622\ e}{p-e}$

model atmosphere - Any theoretical representation of the atmosphere, particularly vertical temperature distribution.

modulation transfer function - A characterization of an optical system in the spatial frequency domain; specifically, the magnitude of the Fourier transform of the line spread function as a function of spatial frequency. (The line spread function describes the display of an extremely narrow straight line.)

modulation transfer function area - The area between the modulation transfer function of an acquisition system and the threshold-of-detectability curve of an observer.

modulator-demodulator (modem) - Refers to the portion of a carrier terminal in which the modulator and demodulator circuits are mounted together on a single panel and may have common elements.

molecular-scale temperature - A temperature parameter TM defined by

$$T_M = \frac{T\,M_o}{M}$$

where T is the actual kinetic temperature, o the molecular weight of air at sea level (28.966), and M the molecular weight of air at the point temperature is being specified. Molecular-scale temperature has application in specifying temperatures at extremely high altitudes. Below about 90 km, Tm=T. Above that level, Tm becomes increasingly greater than T.

Monin-Obukhov length "L" - A rough measure of the height at which turbulence is generated more by buoyancy than by wind shear. In the daytime over land, L is typically between 1 to 50 meters.

Monin-Obukhov similarity hypothesis - States that surface layer quantities, when properly nondimensionalized, become universal functions of Z/L where Z is the height above ground and L is the Monin-Obukhov length.

monitoring - The procedure or operation of locating and measuring radioactive contamination by means of survey instruments which can detect and measure (like dose rates) ionizing radiations. The individual performing the operation is called a monitor.

monochromatic - Pertaining to radiation of a single wavelength.

monodispersed - Pertaining to a distribution of particulates which have a single radius.

month - 1. A measure of time based on the motion of the Moon in its orbit. 2. (anomalistic) The interval of time between two successive passages of the Moon in its orbit through perigee. 3. (calendar) A division of the year as determined by a calendar, approximately one-twelfth of a year in length. While arbitrary in character, the calendar month is based roughly on the synodical month. The calendar month ranges in length from 28 days to 31 mean solar days. 4. (lunar) A synodical month. 5. (nodical) The interval of time between two successive passages of the Moon through the same node of its orbit. The length of the nodical month averages 27.21222 mean solar days. 6. (sidereal) The interval of time it takes the Moon to make its revolution from a given star back to the same star again. The sidereal month may be measured by the interval of time it takes the Moon to revolve from a given celestial longitude back to the same longitude again, reckoned from a fixed equinox. The length of the sidereal month averages 27.321661 solar days. Because of perturbations, the actual length varies some 7 hours. The difference between the lengths of the sidereal and tropical months is attributed to the precession of equinoxes. The previous definition is not precise. The Moon will not return to the same declination at the end of the sidereal month. 7. (synodical, ordinary) The interval of time between two successive conjunctions of the Moon (new moons) or oppositions (full moons). Also called a lunation . The length of the synodical month is 29.530588 mean solar days. It is the month intended when a lunar month is specified. Synodical is preferred over synodic which is sometimes used. 8. (tropical) The interval of time it takes the Moon to make its revolution from a given equinox back to the same equinox again. The tropical month may be measured by the interval of time it takes the Moon to revolve from a given celestial longitude back to the same longitude again, reckoned from an equinox affected by precession. The length of the tropical month averages 27.321582 mean solar days. Because of perturbations, the actual length varies some 7 hours. The difference between the lengths of the sidereal and tropical months is caused by the precession of the equinoxes.

motorboating - The sound heard through the monitoring system speaker of an audio-modulated radiosonde when the audio signal becomes so low in frequency that it resembles the sound of a motorboat.

multipath transmission - The process or condition in which radiation travels between source and receiver via more than one path. Since there can only be one direct path, some process of reflection, refraction, or scattering must be involved.

nadir - Straight down; opposite of zenith.

Nansen bottle - A device used by oceanographers to obtain subsurface samples of seawater. The bottle is lowered by wire; its valves open at both ends and then closed in situ by allowing a weight (called a messenger) to slide down the wire and strike the reversing mechanism. This action causes the bottle to turn upside down, closing the valves, and reversing the thermometers which are mounted in a special case. If, as is usually done, a series of bottles is lowered, the reversal of each bottle releases another messenger to actuate the bottle beneath it.

nearshore circulation - The ocean circulation composed of the nearshore currents and coastal currents.

nearshore current system - The current system caused by wave action in and near the surf zone. The nearshore current system consists of four parts: the shoreward mass transport of water, longshore currents, rip currents, and longshore movement of expanding heads of rip currents.

negative gradient - A layer of water where temperature decreases with depth.

nephelometer - 1. General name for an instrument which measures at more than one angle; the scattering function of particles suspected in a medium. Particle size and visual range can be determined from such measurements. 2. An instrument that estimates the atmospheric extinction coefficient by shining a light through a sample of air and measuring the scattered light.

neutrosphere - The atmospheric shell from the Earth's surface upward in which the atmospheric constituents are for the most part unionized (that is, electrically neutral). The region of transition between the neutrosphere and the ionosphere is somewhere between 70 and 90 km depending on latitude and season.

nocturnal radiation - The excess radiation emitted by the Earth's surface at night relative to that received by the Earth's surface from the atmosphere.

nuclear energy - The energy liberated by a nuclear reaction (fission or fusion) or by radioactive decay.

nuclear radiation - Particulate and electromagnetic radiation emitted from atomic nuclei in various nuclear processes. The important nuclear radiations, from the weapons standpoint, are alpha and beta particles,

gamma rays, and neutrons. All nuclear radiations are ionizing radiations. The reverse, however, is not true. For example, X-rays are included among ionizing radiations, but they are not nuclear radiations, because they do not originate from atomic nuclei. See ionizing radiation and X-rays.

nuclear reaction - A reaction involving an atom's nucleus such as fission, neutron capture, radioactive decay, or fusion. Differs from a chemical reaction, which is limited to changes in the electron structure surrounding the nucleus.

nuclear weapons (or bomb) - A general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission or fusion or both. Thus, the A-(or atomic) bomb and the H-(or hydrogen) bomb are both nuclear weapons. It would be equally true to call them atomic weapons, since it is the energy of the atomic nuclei that is involved in each case. However, it has become more-or-less customary, although it is not strictly accurate, to refer to weapons in which all the energy results from fission as A-bombs or atomic bombs. To make such a distinction, those weapons in which at least part of the energy results from thermonuclear (fusion) reactions of the isotopes of hydrogen are commonly referred to as H- bombs or hydrogen bombs.

nuclide - Any species of atom that exists for a measurable length of time. A nuclide can be distinguished by its atomic weight, atomic number, and energy state. The term is used synonymously with isotope. A radio nuclide is a radioactive nuclide.

Nusselt number - A nondimensional number arising in the problem of heat transfer in fluids. It may be written

$$Nu = \frac{QL}{kS\Delta T}$$

where Q is the quantity of heat transferred in unit time from an immersed body across an area S, T is a characteristic temperature difference, L is a characteristic length, and k is the thermal conductivity. With suitable choices of characteristic quantities, it may be interpreted as the ratio of heat actually transferred to heat that would transfer under circumstances of pure conduction.

Nyquist frequency - The highest frequency which can be determined in a Fourier analysis of a discrete sampling of data. If a time series is sampled at interval t, this frequency is 1/(2t) cps.

Obukhov-Corrsin analyses - A process to predict an inertial subrange behavior for scalars.

Obukhov length - An indicator of stability; proportional to the height at which buoyant production of turbulent energy becomes larger than the shear production of turbulent energy.

occulometer - 1. A movement of ocean water characterized by regularity, either of a cyclic nature or more commonly as a continuous stream flowing along a definable path. 2. Three general classes, by cause, may be distinguished: (a) currents related to seawater density gradients comprising the various types of gradient currents, (b) wind-driven currents directly produced by the stress exerted by the wind on the surface, and (c) currents produced by long-wave motions. The last are principally the tidal currents but may include currents associated with internal waves, tsunamis, and seiches. The major ocean currents are of continuous, stream-flow characters and are of first-order importance in the maintenance of the Earth's thermodynamic balance.

oceanic (or high seas, open ocean) - That portion of the pelagic division seaward from the approximate edge of a continental shelf. See marine environments.

oceanicity (or oceanity) - The degree to which a point on the Earth's surface is in all respects subject to the influence of the sea; the opposite of continentality. Oceanicity usually refers to climate and its effects. One measure for this characteristic is the ratio of the frequencies of maritime to continental types of air masses.

oceanographic equator (or thermal equator) - The zone of maximum sea surface temperature located near the geographic equator. Generally lies north of this line but crosses during the southern summer in the Indian Ocean, western Pacific Ocean, and western Atlantic Ocean. Some oceanographers define the oceanographic equator more specifically as the zone within which the sea surface temperature exceeds 28 °C (82.4 °F).

oceanographic forecasting - The production by automatic or manual means of charts showing forecasted values of oceanographic parameters, similar to weather charts.

oceanographic survey - A study of examination of conditions in the ocean or any part of it with reference to animal or plant life, chemical elements present, and temperature gradients.

oceanography - 1. The study of the sea embracing and integrating all knowledge pertaining to the sea's physical boundaries; the chemistry and physics of seawater and marine biology. 2. In strict usage, oceanography is the description of the marine environment, whereas oceanology is the study of the oceans and related sciences.

oceanology - See oceanography.(2).

offshore - The comparatively flat zone of variable width which extends from the outer margin of the rather steeply sloping shoreface to the edge of the continental shelf. See shore profile.

offshore current - 1. A prevailing nontidal current usually setting parallel to the shore outside the surf zone. See coastal current and nearshore current system. 2. Any current flowing away from shore.

offshore wind - Wind blowing seaward from the land in a coastal area; a land breeze.

one-sigma dispersion - According to probability theory, the error below which approximately 68 percent of all samples of the data will fall assuming a Gaussian distribution. See standard deviation.

onshore - The direction landward from the sea.

onshore wind - Wind blowing landward from the sea in a coastal area; a sea breeze.

optical filter - A device, which changes by absorption or interference, the magnitude or the spectral distribution of the radiant energy passing through it.

optical line of sight - The generally curved path of visible light through the atmosphere. Often used erroneously for geometrical line of sight.

optical turbulence - Irregular and fluctuating gradients of optical refractive index in the atmosphere. Optical turbulence is caused mainly by mixing air of different temperature so convection occurs, particularly by thermal gradients which are sufficient to reverse the normal decrease in density with altitude,

optimum ship routing - A technique for routing ships based on knowledge of sea currents, weather, and wave conditions to get them to their destinations in the quickest time and with least damage to cargo or discomfort to passengers.

orientation, target (target acquisition cycle) - The determination of whether an object is symmetric or asymmetric; thereby, discerning its orientation.

outer atmosphere - Very generally, the atmosphere at a great distance from the Earth's surface; possibly best used as an approximate synonym for exosphere.

overcast - 1. Descriptive of a sky cover of 1.0 (95 percent or more) when at least a portion of this amount is attributable to clouds or obscuring phenomena aloft; that is, when the total sky cover is not due entirely to surface-based obscuring phenomena. In aviation weather observation, an overcast sky cover is denoted by the symbol; it may be explicitly identified as thin (predominantly transparent), otherwise a predominantly opaque status is implicit. An opaque overcast sky cover always constitutes a ceiling.
2. Popularly, a cloud layer that covers most or all of the sky. Generally suggests a widespread layer of clouds such as that considered typical of a warm front.

ozonosphere; ozone layer - The general stratum of the upper atmosphere in which there is an appreciable ozone concentration and in which ozone plays an important part in the radiative balance of the atmosphere. This region lies roughly between 10 and 50 km with maximum ozone concentration at about 20 to 25 km.

- P -

parent - A radionuclide which upon disintegration yields a specified nuclide either directly or as a later member of a radioactive series.

particle size distribution - A mathematical or other description of the sizes of the particles occurring in a specified atmospheric condition.

particulate - Any particle (liquid or solid) suspended in or falling through the atmosphere. A substance composed of very small separate particles.

passive remote sensing device - Uses naturally available radiant energy, that is, photography of natural light usually more simple and less expensive than active remote sensing devices.

perturbation - Any departure introduced into an assumed steady state of a system.

perturbations of a satellite orbit - Deviations of the motion of an Earth satellite from an ellipse because of noncentral forecast arising from the nonsphericity of the Earth and atmospheric drag.

photometer - An instrument that measures the intensity of radiation, usually in the visible and near IR wavelengths.

photometric - Pertaining to the study of the measurement of luminous intensity (light or visible radiation).

photon - The elementary quantity of radiant energy. A discrete bundle of radiant energy.

physical oceanography - The study of the physical aspects of the ocean such as its density, temperature, ability to transmit light and sound, and sea ice; the movements of the sea namely, tides, currents, and waves; and the variability of these factors both geographically and temporally in relationship to the adjoining domains, namely, the atmosphere and the ocean bottom.

physical properties - The physical characteristics of seawater such as temperature, salinity, density, velocity, sound, electrical conductivity, and transparency.

pilot balloon observation (pibal) - A method of winds-aloft observation; the determination of wind speeds and wind directions in the atmosphere above a station. This observation is done by reading the elevation and azimuth

angles of a theodolite while visually tracking a pilot balloon. The ascension rate of the balloon is approximately determined by careful inflation to a given total lift. After release from the ground, periodic readings (usually at 1-minute intervals) of elevation and azimuth angles of the balloon are recorded. These data are transferred to a winds-aloft plotting board, and the windspeed and wind direction at selected level are calculated by trigonometric methods.

planck function - An expression for the blackbody emittance as a function of temperature and the wavelength of emission.

planetary boundary layer - The layer of the atmosphere from the Earth's surface to the geostrophic wind level including the surface boundary layer and the Ekman layer.

plowshare - The Department of Energy's program of research and development on peaceful uses of nuclear explosives. Possible uses include large-scale excavation for canals and harbors, crushing ore bodies, and producing heavy transplutonium isotopes.

plutonium - A heavy, radioactive, metallic element with atomic number 94. Its most important isotope is fissionable plutonium-239, produced by neutron irradiation of uranium 238.

pole - 1. (grid) The northerly direction indicated by the arbitrary vertical line of a grid. Also, the northerly direction of the line through a point parallel to the Central Meridian or Axis of Y of a system of plane rectangular coordinates.
2. (magnetic) The direction indicated by the north-seeking element of a magnetic compass when influenced only by the Earth's magnetic field.
3. (north) The approximate direction of the north pole from the observer.
4. (true) The direction of the north celestial pole.

polychromatic - Pertaining to radiation of many wavelengths.

polydispersed - Pertaining to a distribution of particulates which have many different radii.

potential temperature - The temperature a parcel of dry air would have if brought adiabatically from its initial state to the (arbitrarily selected) standard pressure of 1000 mb.

power density spectrum - A measure of the contribution to the total variance from a given frequency band in the generalized Fourier representation of a random function.

precipitable water (PW) - The total atmospheric water vapor contained in a vertical column of unit cross-sectional area extending between any two specified levels, commonly expressed in terms of the height to which that water substance would stand if completely condensed and collected in a vessel of the same unit cross section.

precipitation - Water particles, liquid or solid, which fall from the atmosphere and reach the ground including drizzle, rain, snow, snow pellets, snow grains, sleet, ice crystals, ice pellets, and hail. Precipitation is measured in millimeters or in liquid water depth of the water substance which has fallen at a given point over a specified period of time. Frozen precipitation is melted and then measured.

Precipitation intensities

	Rain or Ice Pellets	Snow or Drizzle
Light	.10" or less/hr 0.01" or less/6 min	vsby 5/8 mile or more
Moderate	.11" to .30"/hr more than 0.01" to 0.03"/6 min	vsby less than 5/8 to 5/16 mile
Heavy	more than .30"/hr more than 0.03"/6 min	vsby less than 5/16 mile
No intensity is assigned to hail or ice crystals.		severe thunderstorm (T+) wind gusts 50 knots or greater or hail ¾" or greater in diameter.

precision - The degree of refinement with which an operation is performed or a measurement is stated.

precision guided munition (PGM) - A bomb or missile that is guided during its terminal phase.

pressure altitude - The altitude in the standard atmosphere at which a given pressure will be observed. It is the indicated altitude of a pressure altimeter setting of 29.92 inch of mercury 1013.2 mb constant-pressure surface.

pressure altitude, standard - An altitude corresponding to a given pressure; a standard atmosphere.

pressure jump - A rise in pressure exceeding 0.005 inch per minute which totals 0.02 inch or more.

pressure tendency (or barometric tendency) - The character and amount of atmospheric pressure change for a 3 hour or other specified period ending at the time of observation. The characteristic of the change is determined by the appearance of the barogram and the direction of change (higher or lower) from the initial value. These characteristics are combined into a single code digit. The amount of change is expressed in tenths of millibars. This information is reported only by stations equipped with a microbarograph.

prevailing wind - The wind direction most frequently observed during a given period. The periods most frequently used are the observational day, month, season, and year. Methods of determination vary from a single count of periodic observations to the computation of a wind rose.

profile (meteorology) - A graph of the value of a scalar quantity versus a horizontal, vertical, or time scale; usually refers to a vertical representation.

propagation anomaly - In underwater acoustics, the difference between the actual propagation loss for a given length of water path and the nominal value of propagation loss identified with the distance covered by that path.

propagation loss - The transmission loss associated with any given length of ray path in the water.

pseudotarget - An object or image that might be mistaken for the true target; a group of pseudotargets appearing in a scene constitutes a form of clutter.

psychrometer - An instrument for measuring the water vapor content of the atmosphere. A type of hygrometer consisting of two thermometers, one (the dry bulb) is an ordinary glass thermometer, while the other (wet bulb) has its bulb covered with a jacket of clean muslin saturated with distilled water prior to an observation. When the bulbs are suitably ventilated, they indicate the thermodynamic wet- and dry-bulb temperatures of the atmosphere.

rabal - A method of winds-aloft observation; the determination of wind- speeds and wind directions in the atmosphere above a station. Such observations are accomplished by recording elevation and azimuth angles of the balloon at specified intervals while visually tracking a radiosonde balloon with a theodolite. A rabal is basically the same as pilot-balloon observation, except that the height data are derived from the radiosonde observation rather than from an assumed balloon ascension rate.

rad - Radiation absorbed dose. The basic unit of absorbed dose of ionizing radiation. One rad is equal to the absorption of 100 ergs of radiation energy per gram of matter.

radar - The line traced on amplitude-modulated indicators which corresponds to the power level of the weakest echo detected by the radar. It is traced with every pulse transmitted by the radar, but appears as a nearly continuous display on the scope. Target signals show up as perpendicular deviations from the base line, range is measured along the base line, signal strength is indicated by the magnitude of the deviations, and the type of target usually can be determined by the appearance of the deviations.

radar wind system - Apparatus which uses radar techniques to determine the range, elevations, and azimuth of a free-floating target and to compute upper-air wind data; a type of rawin system.

radiance - 1. The radiometric term specifying the amount of power radiated from an extended body per solid angle and per projected area of radiating surface expressed in watts per steradian per square meter. 2. In radiometry, a measure of the intrinsic radiant intensity emitted by a radiator in a given direction. It is the irradiance (radiant flux density) produced by radiation from the source on a unit surface area oriented normal to the line between source and receiver divided by the solid angle subtended by the source at the receiving surface. It is assumed that the medium between the radiator and receiver is perfectly transparent; therefore, radiance is independent of attenuation between source and receiver. 3. The radiometric term specifying the amount of power radiated from an extended body per solid angle and per projected area of radiating surface expressed in watts per steradian per square meter.

radiance, path - The radiant energy scattered into or emitted in the line of sight between the target and the sensor. This energy degrades the target-to-background contrast transmission along the line of sight by introducing non-imaging energy.

radiant energy - The energy of any type of electromagnetic radiation.

radiant flux - The rate of emission or transmission of radiant energy.

radiant power - Same as radiant flux.

radiation - 1. The transfer of energy by means of electromagnetic waves or particles. 2. The propagation of energy through matter or space in the form of waves. In atomic physics, the term has been extended to include fast-moving particles (alpha and beta rays and free neutrons). Gamma rays and X-rays, of particular interest in atomic physics, are electromagnetic radiation in which energy is propagated in packets called photons. 3. The emission and propagation of energy through space or through a material medium in the form of waves (for example, the emission and propagation of electromagnetic, sound, or elastic waves). 4. The energy propagated through space or through a material medium as waves (for example, energy in the form of electromagnetic or elastic waves). The terms radiation or radiant energy, when unqualified, usually refer to electromagnetic radiation. Such radiation commonly is classified according to frequency, as Hertzian, infrared, visible (light), ultraviolet, X-ray, and gamma ray. See photon. 5. By extension, corpuscular emissions such as alpha and beta radiation or rays of mixed or unknown type such as cosmic radiation.

radiation protection guide - The total amount of ionizing radiation dose over certain periods of time which may safely be permitted for exposed industrial groups. These standards established by the Federal Radiation Council are equivalent to what was formerly called the "maximum permissible exposure."

radioactive cloud (or nuclear) - An all-inclusive term for the cloud of hot gases, smoke, dust, and other particulate matter from the weapon itself and from the environment, which is carried aloft in conjunction with the rising fireball produced by the detonation of a nuclear (or atomic) weapon. Also, the cloud formed by venting to the atmosphere of radioactivity produced in an underground nuclear explosion.

radioactivity - The spontaneous emission of radiation, generally alpha or beta particles often accompanied by gamma rays, from the nuclei of an (unstable) isotope. As a result of this emission, the radioactive isotope is converted (or decays) into the isotope of a different (daughter) element which may (or may not) also be radioactive. Ultimately, as a result of one or more stages of radioactive decay, a stable (nonradioactive) end product is formed. See isotope.

radioactivity concentration guide - The concentration of radioactivity in an environment which results in doses equal to those in the radiation protection

guide. This Federal Radiation Council term replaces the former "maximum permissible concentration."

radioisotope - An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. More than 1300 natural and artificial radioisotopes have been identified.

radiometer - An instrument for measuring radiant energy. The Dines radiometer consists of an ether differential thermometer with blackened bulbs. One of the bulbs is exposed to the unknown radiation and the other to a blackbody source whose temperature can be varied. Equality of radiation is indicated by the balance of the differential thermometer.

radio meteorology - That branch of meteorology which embraces the propagation of radio energy through the atmosphere and the use of radio and radar equipment.

radiosonde - A balloon-borne instrument for the simultaneous measurement and transmission of meteorological data. The instrument consists of transducers for the measurement of pressure, temperature, and humidity; a modulator for the conversion of the output of the transducers to a quantity which controls a property of the radio frequency signal; a selector switch which determines the sequence of the parameters to be transmitted; and a transmitter which generates the radio-frequency carrier.

radiosonde commutator - A component of a radiosonde consisting of a series of alternate electrically conducting and insulating strips. As these strips are scanned by a contact, the radiosonde transmits temperature and humidity signals alternately. The contact may be a baroswitch as in the Diamond-Hinman radiosonde or be motor driven.

radiosonde modulator - That part of an audio-modulated radiosonde consisting of the baroswitch, the sensor elements, the reference elements, and the relay.

radiosonde observation - An evaluation in terms of temperature, relative humidity, and pressure aloft of radio signals received from a balloon-borne radiosonde. The height of each mandatory and significant pressure level of the observation is computed from these data.

radiosonde recorder - An instrument located at the surface observing station which is used to record the data presented by the radiosonde aloft. The mechanism of the recorder depends upon the type of radiosonde system used.

radiosonde transmitter - The component of the radiosonde which includes the modulating blocking oscillator and the radio frequency carrier oscillator.

rain - Precipitation composed of liquid water drops with diameters 0.02 inch or greater.

rainout - The removal of radioactive particles from a nuclear cloud by precipitation when the cloud is within a rain cloud. See washout.

random variable - A variable characterized by random behavior in assuming its different possible values.

range - The distance between two points on the ground or in the atmosphere.

range gated - A pulsed (over a time period) emission received by a sensor which is functioning only at the time that the radiation from a specific range interval between r and r+ ^r is arriving, where r is the range.

range measuring system (RMS-2) - A radio frequency system that collects data from which a three-dimensional position as a function of time can be calculated for transponder-instrumented aircraft and ground vehicles.

range, meteorological - The visual range at which the apparent contrast is a predetermined value. Usually, the value 0.02 is used.

range, target acquisition - Describes the range equivalent to the detection range, the orientation range, the recognition range, or the identification range.

range, visual (or daytime visual range) - The distance, under daylight conditions, at which the apparent contrast between a specified type of target and its background becomes just equal to the threshold contrast of the observer.

ratio, contrast - Same as contrast, aerial.

rawin - A method of winds-aloft observation; that is, the determination of wind speeds and wind directions in the atmosphere above a station accomplished by tracking a balloon-borne radar target, responder, or radiosonde transmitter with either radar or a radio direction finder. With a radio direction finder, the height must be supplied by other means, normally by concurrent radiosonde observation. With radar, if height data are not otherwise supplied, the slant range must be recorded in addition to the angles of elevation and azimuth.

rawinsonde - 1. A method of upper-air observation consisting of an evaluation of the windspeed and wind direction, temperature, pressure and relative humidity aloft by means of a balloon-borne radiosonde tracked by a radar or radio direction finder. If radar is used for tracking, a radar target is also attached to the balloon, thus combining a radiosonde observation with a type

of rawin observation. Height data pertaining to significant levels aloft are computed from the radiosonde data, while wind data are derived by trigonometric computations. 2. A system used for meteorological upper-air observations in the lowest 30 km of the atmosphere. A balloon-borne sonde telemeters data of temperature, pressure, and humidity to a ground-based receiver, and an automatic tracking antenna follows the motion of the balloon to determine winds.

Rayleigh number - The nondimensional ratio between the product of buoyancy forces and heat advection and the product of viscous forces and heat conduction in a fluid. It is written as

$$Ra = \frac{g\,|\Delta T|\,\alpha d^3}{\nu K}$$

where g is the acceleration of gravity, ΔT is a characteristic vertical temperature difference in the characteristic depth d, α the coefficient of expansion, ν the kinematic viscosity, and K the thermometric conductivity.

Rayleigh scattering - Any scattering process produced by a spherical particles whose radii are smaller than about one-tenth the wavelength of the scattered radiation.

ray path - The imaginary line along which the energy associated with a point on a wave front moves. The ray paths encountered in acoustics (commonly called sound rays) are analogous to the light rays of optics. Ray paths and wave fronts are mutually perpendicular.

ray pattern - A graphic presentation of the paths of sound rays in relation to depth and range.

ray theory - A method for determining the path of transmitted underwater sound based on Snell's law. This law describes the change in the sound ray path as it passes through different density (sound velocity) layers.

real time - An implied reference speed of physical events for comparison with computer processing speed. For example, it might be said that the computer required 300 times real time to perform a simulation. The performance of a computation during the actual time that the related physical process transpires so the results of the computations are useful in guiding the physical process.

real-time data - Data presented in usable form at essentially the same time the event occurs. The delay in presenting the data must be small enough to allow a corrective action to be taken if required.

real-time operation - The performance of a computation during the actual time that the related physical process transpires so the results of the computations are useful in guiding the physical process.

recognition, target - In the target acquisition cycle, the point the class to which an object belongs may be discerned (for example, house, truck, or man).

recorded overpressure (or pressure amplitude) - Pertains to acoustics. The term recorded implies that the pressures have been doubled because of surface reflection.

reflectance ® - The ratio of the luminous (or radiant) flux reflected from a surface to the total flux incident (illuminance or irradiance) upon that surface; varies according to the wavelength and angle of the incident radiation ($1 > R > 0$).

reflectivity - The ratio of the radiant energy reflected by a body to the total incident on it.

refraction - 1. The change in direction of energy propagation as a result of density changes within the propagating medium or at interfaces between media of differing densities. Atmospheric optical and electromagnetic phenomena associated with refraction are halos, mirages, looming and sinking, towering and stooping, and the anomalous propagation of electromagnetic energy. Also, phenomena associated with scintillation (laurence, shimmer) and in EO systems, coherence degeneracy, angle of arrival variations (quivering), and random amplitude and intensity variations (scintillation). 2. The process in which the direction of energy propagation is changed as the result of a change in density within the propagation medium, or as the energy passes through the interface representing a density discontinuity between two media. See refractive index.

refraction, complex index of - An extension of the index of refraction to a consideration of the absorption of radiant energy by a substance.

refractive index (or index of refraction) - 1. A measure of the amount of refraction (a property of a dielectric substance). The ratio of the wavelength or phase velocity of an electromagnetic wave in a vacuum to that in a substance. Can be a function of wavelength, temperature, atmospheric pressure, and water vapor pressure. 2. The light bending power of an optical material (glass and plastic); chief identification of optical glass types.

$$n = \frac{\sin i}{\sin r} \qquad \text{(Snell's law)}$$

where n = refractive index, i = angle of incidence, and r = angle of refraction.

3. The ratio of the free-space velocity 'c' to the phase velocity of electromagnetic radiation in a given medium.

refractive index structure coefficient (C_N^2) - Typifies the nature or strength of the atmospheric turbulence; also optical turbulence.

refractivity - 1. Equal to (refractive index - 1) x 10^6. 2. - The algebraic difference between a refractive index value and unity, equal to (refractive index -1) x 10^6. Refractivity may be more conveniently expressed in N-units; $N = (n-1)10^6$. The deviation of radio refractivity at any altitude from the usual standard profile may be shown as a variation about a vertical axis (at the ground-level value of refractivity) by using B-units; B = N+0.012h where h is altitude above ground level in feet. The deviation of refractivity at any altitude from the gradient at which the refractive curvature of a tangential ray will match the curvature of the Earth, may be shown as a variation about a vertical axis (at the ground-level value of refractivity) by using M-units: m = N+0.048h where 0.048h is 10^2h divided by the radius of the Earth in feet.

relative biological effectiveness (RBE) - The relative effectiveness of a given kind of ionizing radiation in producing a biological response as compared with 250,000 electron volt gamma rays.

relative current - The current which is a function of the dynamic slope of an isobaric surface and which is determined from an assumed layer of no motion. The current flows along the contours of dynamic topography. The surface slopes upward to the right of the current in the Northern Hemisphere and to the left in the Southern Hemisphere.

relative current speed - The speed determined by the spacing of dynamic contours drawn at equal intervals of dynamic height anomaly; the speed is inversely proportional to the distance between contours.

relaxation time - 1. In general, the time interval required for a system exposed to some discontinuous change of environment to undergo the fraction ($1-e^{-1}$), or about 63 percent of the total change of state which it would exhibit after an indefinitely long time. 2. The relaxation time of an instrument is commonly called its time constant or lag coefficient.

rem - (roentgen equivalent man) - A unit of absorbed radiation dose in biological matter that is equal to the absorbed dose in rads multiplied by the relative biological effectiveness of the radiation.

research rocket; sounding rocket - A vehicle used to determine the validity or reliability of data and equipment being developed; a rocket vehicle designed for or adapted to high altitude research usually above 100 km.

residual nuclear radiation - Nuclear radiation, chiefly beta particles and gamma rays which persist for some time following a nuclear (or atomic) explosion. Such radiation is emitted mainly by the fission products and other bomb residues in the fallout and to some extent by Earth and water constituents and other materials in which radioactivity has been induced by the capture of neutrons. See fallout, induced radioactivity.

resolution - A measure of the smallest separation that a system can discriminate; often expressed as an angle in milliradians or minutes of arc.

resultant wind (meteorology) - The vectorial average of all wind directions and wind speeds for a given level at a given place for a certain period such as a month. Obtained by resolving each wind observation into components from north and east, summing over the given period, obtaining the averages, and reconverting the average components into a single vector.

reverberation - Sound scattered towards the source, principally from the ocean surface (surface reverberation) or bottom (bottom reverberation) and from small scattering sources in the medium such as bubbles of air and suspended solid matter (volume reverberation).

reverberation index - The measure of the ability of an echo-ranging transducer to distinguish the desired echo from the reverberation. Computed from the directivity patterns as ratio in decibels of the bottom, surface, or volume reverberation response of a specific transducer to the corresponding response of a nondirectional transducer.

reverberation strength - The difference between the level of a plane wave producing in a nondirectional transducer a response equal to that produced by the reverberation corresponding to a range of 1 yard from the effective center of the transducer and the index level of the pulse transmitted on any bearing by the same nondirectional transducer.

Reynolds number - The nondimensional ratio of the inertial force to the viscous force in fluid motion,

$$\mathrm{Re} = \frac{LU}{\nu}$$

where L is a characteristic length, ν the kinematic viscosity, and U a characteristic velocity.

Reynolds shear stress - Turbulent contribution to total shear stress.

Reynolds stress - Fundamental stresses (τ), also termed eddy shearing stresses which operate within a turbulent fluid to transport momentum.

Richardson number - 1. A nondimensional number arising in the study of shearing flows of a stratified fluid.

$$RI = gB / (\delta U/\delta z)2\theta$$

where g is the acceleration of gravity, B a representative vertical stability (commonly $\delta\theta/\delta z$, where θ is potential temperature) and $\delta U/\delta z$ a characteristic vertical shear of the wind. 2. - A nondimensional number; the ratio of work done against gravitational stability to energy transferred from mean to turbulent motion.

ridge; wedge (meteorology) - An elongated area of relatively high atmospheric pressure almost always associated with and most clearly identified as an area of maximum anticyclonic curvature of wind flow. The locus of this maximum curvature is called the ridge line. Sometimes, particularly in discussion of atmospheric waves imbedded in the westerlies, a ridge line is considered to be a line drawn through all points at which the anticyclonically curved isobars or contour lines are tangent to a latitude circle. The most common use of this term is to distinguish it from the closed circulation of a high, or anticyclone. However, a ridge may include a high, an upper-air ridge may be associated with a surface high, and a high may have one or more distinct ridges radiating from its center. The opposite of a ridge is a trough.

rip current - The return flow of water piled up on shore by incoming waves and wind. A strong narrow surface current flowing away from the shore consisting of three parts: the feeder current flowing parallel to the shore inside the breakers, the neck where the feeder currents converge and flow through the breakers in a narrow band or rip, and the head where the current widens and slackens.

roentgen - A unit of exposure to gamma (or X) radiation. Defined precisely as the quantity of gamma (or X) rays that will produce electrons (in ion pairs) with a total charge of 2.58×10^{-4} coulomb in 1 kilogram of dry air. An exposure of 1 roentgen results in the deposition of about 94 ergs of energy in 1 gram of soft body tissue. Hence, an exposure of 1 roentgen is approximately equivalent to an absorbed dose of 1 rad in soft tissue. See dose, rad.

Rossby number - The nondimensional ratio of the inertial force to the coriolis force for a given flow of a rotation fluid.

rotary current - A tidal current that flows continually with a direction of flow changing through all points of the compass during a tide cycle. Rotary currents usually occur offshore where the direction of flow is not restricted. Unless modified by local conditions, the change in direction is generally clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. The speed of the current usually varies throughout the tide cycle, passing through two maximums in approximately opposite directions and two minimums where the direction of the current is approximately 90^0 from the direction at time of maximum speed.

roughness length - 1. $Z_0 = E/30$, where E is the average height of surface irregularities. 2. A quantity (Z_0), also called the roughness coefficient, which enters as a constant of integration into the form of the logarithmic velocity profile appropriate to fully rough flow near the Earth's surface.

runway visual range (RVR) - 1. The maximum distance along a runway at which the runway lights are visible to a pilot after touchdown. The RVR is often used as an operational weather limit. Normally, it is an instrumental determination by a transmissometer combined with an analog processor. 2. In one instrument which is widely used, the computation of RVR for daylight hours is based on the attenuation of contrast (using Koschmieder's law and assuming the pilot's threshold contrast to be 0.02). For nocturnal hours, the calculation of RVR by this instrument uses the intensity settings of runway lights and is based on the attenuation of flux density (using Allard's law and assuming the pilot's threshold illuminance to be a constant). See meteorological range, visibility, visual range.

salinity - 1. A measure of the quantity of dissolved salts in seawater. Formally defined as the total amount of dissolved solids in seawater in parts per thousand ($^{o}/_{oo}$) by weight when all the carbonate has been converted to oxide, the bromide and iodide to chloride, and all organic matter are completely oxidized. These qualifications result from the chemical difficulty in drying the salts in seawater. In practice, salinity is not determined directly but is computed from chlorinity, electrical conductivity, refractive index, or some other property whose relationship to salinity is well established. 2. Because of the Law of Constancy of Proportions, the amount of chlorinity in a seawater sample is used to establish the sample's salinity. 3. The relationship between chlorinity Cl and salinity S as set forth in Knudsen's Table is S = 0.03+1.805 Cl. 4. A joint committee of IAPO, UNESCO, ICES, and SCOR proposed the universal adoption of the following equation for determining salinity from chlorinity: S = 1.80655 Cl. Subsequently adopted by IAPO in 1963 and ICES in 1964.

salinometer (or salinity bridge) - Any device or instrument for determining salinity, especially one based on electrical conductivity methods.

scale of turbulence - The Eulerian time scale of turbulence L_τ is defined as

$$L_\tau = {}^{o}/_{o}\, r\,(\tau)\, D$$

where r (τ) is the correlation coefficient and L_τ must exist for the Ergodic hypothesis to be true as a function of time.

scattering - 1. The process by which small particles suspended in a medium of a different index of refraction diffuse a portion of the incident radiation in all directions. In scattering, no energy transformation results, only a change in the spatial distribution of the radiation. 2. The random dispersal of sound energy after it is reflected from the sea surface or sea bottom and/or off the surface of solid, liquid, or gaseous particles suspended in the water. 3. The dispersion of light when a beam strikes very small particles suspended in air or water. Theoretically, in light scattering there is no loss of intensity but only a redirection of light. 4. Change of direction of a subatomic particle or photon as a result of a collision or interaction.

scattering, anomalous - The spurious scattering of radiant energy which cannot be accounted for by the Mie or Rayleigh scattering theories.

scattering coefficient (or total scattering coefficient) - 1. A measure of the attenuation caused by the scattering of radiation as it traverses a medium containing scattering particles. 2. A measure of the decrease in radiation

intensity caused by scattering as the radiation passes through the atmosphere (or other medium).

scattering factor - The ratio of the amount of radiation (at a specific wavelength) scattered by a substance (for example, haze) to the total amount of radiation (at a specific wavelength) incident on the substance. The values of the scattering factor range from zero to one. A value of one implies that all electromagnetic radiation incident on a substance is scattered.

scattering, Mie - The distribution of energy which results from the interaction of energy incident on spherical particles whose radii are greater than approximately one-tenth of the wavelength of the incident energy.

scattering, molecular (Rayleigh) - The distribution of energy which results from the interaction of energy incident on spherical particles whose radii are less than approximately one-tenth of the wavelength of the incident energy.

scavenging - The selective removal of material from the radioactive cloud of a nuclear explosion by inert substances such as earth or water introduced into the fireball. The term is also applied to the process of removal of fallout particles from the atmosphere by precipitation. See rainout, snowout, and washout.

scintillations - Rapid changes in brightness, apparent position, or color of a distant object. Refractive index changes on an optical beam through the atmosphere cause intensity fluctuations observed as scintillations.

sea breeze - A light wind blowing toward the land caused by unequal heating of land and water masses.

sea clutter - See sea return.

sea floor (or sea bed, sea bottom) - The bottom of the ocean where there is a generally smooth, gentle gradient. In many cases, depth is disregarded and the term is used to designate areas in basins or plains or on the continental shelf.

sea fog - A type of advection fog formed when air that has been lying over a warm water surface is transported over a colder water surface resulting in cooling of the lower layer of air below its dew point.

sea level - In general, the surface of the sea used as a reference for elevation. In surveying and mapping, a curtailed form of mean sea level (should be avoided; but if used, should be in the context of mean sea level).

sea level datum - A determination of mean sea level that has been adopted as a standard datum for heights. The sea level is subject to some variations from year to year but as the permanency of any datum is of prime importance in engineering work, a sea level datum after adoption should, in general, be maintained indefinitely even though differing from later determination of mean sea level based upon a longer series of observations.

sea level pressure - The atmospheric pressure at mean sea level, either directly measured or most commonly, empirically determined from the observed station pressure. In regions where the Earth's surface is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at a point at sea level directly below if air of a temperature corresponding to that actually present at the surface were present all of the way down to sea level. In actual practice, the mean temperature for the preceding 12 hours, not the current temperature, is employed. This "reduction of pressure to sea level" is responsible for many anomalies in the pressure field in mountain areas on the surface synoptic chart.

sea return (or sea clutter) - Radar echoes reflected from the sea.

sea slick - An area of sea surface, variable in size, and markedly different in appearance with color and/or oiliness usually caused by plankton blooms.

sea state (or state of the sea) - The numerical or written description of ocean surface roughness. For more precise usage, sea state may be defined as the average height of the highest one-third of the waves observed in a wave train. Referred to a numerical code which covers an increasing range of such heights as indicated by WMO Code 75 table below.

Code	Wave height (feet)
0	0
1	0 - 1/3
2	1/3 - 1 2/3
3	1 2/3 - 4
4	4 - 8
5	8 - 13
6	13 - 20
7	20 - 30
8	30 - 45
9	Over 45

seawater - 1. The water of the seas distinguished from freshwater by its appreciable salinity. The amount of salinity greatly affects the water's physical characteristics. 2. The distinction between the usage of saltwater

and seawater is not very sharply drawn. Commonly, seawater is used as the antithesis of such specific types of freshwater as riverwater, lakewater, and rainwater, whereas saltwater is merely the antithesis of freshwater in general.

sediment - Particulate organic and inorganic matter which accumulates in a loose unconsolidated form. It may be chemically precipitated from solution, secreted by organisms or transported by air, ice, wind, or water and deposited.

seeability - 1. (RCC/MG 1982) The maximum distance (expressed in kilometers) at which a specific sensor is able to acquire or designate a target. Seeability is a function of sensor wavelength, atmospheric parameters, target-to-background contrasts, target/sensor aspect angle, direction and type of illumination, sensor characteristics, and operational tactics. 2. (ASL 1982) A maximum line-of-sight distance at which a target sensing device using passive or active sources of electromagnetic radiation is able to acquire (detect, orient, recognize, identify, lock-on) or designate (illuminate, irradiate) a target considering the intervening existing or predicted environmental and background conditions. A device's seeability, S, may be defined as

$$S = \frac{1}{\sigma_e} \ln \frac{C}{\varepsilon}$$

where σ_e is the extinction coefficient for the desired wavelength, C is the inherent contract of the target against the background, and ε is the threshold contrast of the sensor. Seeability is wavelength-dependent and is a function of target-to-background contrast, clutter, natural and man-made aerosols (for example, clouds, haze, smoke, fog, precipitation, and dust), target/sensor aspect angle, direction and type of illumination, and sensor characteristics. Therefore, seeability is a measure of the ability of a sensor to acquire or designate a target.

seepage - A very slow release from an underground nuclear explosion of relatively small amounts of radioactivity per unit time for times extending from hours to perhaps days.

seiche - 1. The standing wave oscillation of an enclosed or semienclosed water body that continues, pendulum fashion, after the cessation of a seismic, atmospheric, or wave induced force. 2. An oscillation of a fluid body in response to a disturbing force having the same frequency as the natural frequency of the fluid system. Tides caused by the Sun and Moon.

semiactive guidance system - See sensor, semiactive.

sensor - A device, usually electronic, that extends man's natural senses by means of emitted or reflected energy. The energy may be nuclear, electromagnetic including the visible and invisible portions of the spectrum, chemical, biological, thermal, or mechanical.

sensor, active - An electro-optical sensor which also illuminates (or irradiates) a target or other object and senses the reflected (or scattered) energy coming from the target (for example, a radar guided missile).

sensor, electro-optical - The component of an electro-optical system which converts input electromagnetic energy of a specific wavelength or band or wavelengths into electrical energy measured by another part of the component. Examples include the human eye, a TV camera, and a photographic camera.

sensor, passive - An electro-optical sensor which perceives the emitted or reflected natural energy from a target or other object.

sensor, semiactive - An electro-optical sensor which perceives the reflected energy from a target or other object; however, the reflected energy is created by illumination or irradiation by an unnatural source such as a laser designator.

set - 1. (current direction) The direction toward which the current flows. Usually indicated in degrees true or points on the compass. 2. (settle) To attach to a surface as done by the larvae of various marine invertebrates.
3. The periodic attachment of many marine invertebrate larvae, especially barnacles and bivalves, to a surface.

Sferics receiver (lightning recorder) - An instrument which measures electronically the direction of arrival, intensity, and rate of occurrence of atmospherics. In its simplest form, the instrument consists of two orthogonally crossed antennas whose output signals are connected to an oscillograph so that one loop measures the east-west component. These loops are combined vertically to give the azimuth. A type of radio direction finder.

shadow zone - A region into which very little sound energy penetrates.

shallow water (or very shallow water) - 1. Commonly, water of such a depth that surface waves are noticeably affected by bottom topography. Customarily, water of depths less than half the surface wavelength is considered shallow water. 2. In hydrodynamics with regard to progressive gravity waves, water in which the depth is less than 1/25 the wavelength.

shear - 1. The angle between the surface wind and the wind vector sum in a hodograph. 2. The variation (usually the directional derivative) of a vector field along a given direction in space. The most frequent context for this concept is wind shear.

shear line (meteorology) - A line or narrow zone across which there is an abrupt change in the horizontal wind shear.

shear stress - Often referred to in meteorology as the stress on a horizontal surface in the direction of the wind.

shine - The external gamma radiation received by a receptor outside the boundaries of radioactive clouds or areas.

shipborne expendable bathythermograph (BT) - An instrument system designed to record water temperature with depth from a ship moving at speeds up to 25 knots in sea states up to 6 (13 to 20 feet) without interference to normal ship routine. It can provide measurements from surface to 1,500 feet with an accuracy of +2 percent or 15 feet whichever is greater and a temperature accuracy of +0.4 °F over a range of 28 to 95 °F.

shoal - 1. A submerged ridge, bank, or bar consisting of, or covered by, unconsolidated sediments (mud, sand, gravel) which is at or near enough to the water surface to constitute a danger to navigation. If composed of rock or coral, it is called a reef. (An offshore hazard to navigation with a least depth of 10 fathoms (20 meters) or less, composed of unconsolidated material). 2. (or school) A great number of fish or aquatic animals thronged together or considered as a group (for example, herring shoals). 3. Having little depth; to cause to become shallow. 4. To proceed from a greater to a lesser depth of water. 5. To become shallow gradually.

shoal area - An area dangerous to surface ships in which there are depths of 10 fathoms or less over a bottom which is not rocky.

shoaling - 1. A bottom effect describing the height of waves, not their direction. Can be divided into two parts which occur simultaneously. One part has to do with the fact that waves become less dispersive close to the shore, and because the same energy can be carried by high waves of less height, this effect causes a gradual decrease in the wave height. In the other part, the waves slow down, the crests move closer together, and because the energy between crests remains relatively fixed, the waves can become higher near shore. 2. These effects are evidenced in the initial decrease in height of the incoming wave, then an increase in height as the wave comes into shore.

signal-to-noise ratio - The ratio of the peak-to-peak amplitude of a signal to the root-mean-square amplitude of the noise superimposed on the signal.

signature - 1. A characteristic frequency pattern of the target displayed by detection and classification equipment. 2. A graph of pressure versus time at a point as a ship passes over it. Increased water velocity in the constriction between the ship and the bottom of the water basin causes a pressure variation (Venturi effect).

significant wave - 1. A statistical term relating to the one-third highest waves of a given group and defined by the average of their heights and periods. 2. The composition of the higher waves depends upon the extent to which the lower waves are considered. Experience so far indicates that a careful observer who attempts to establish the character of the higher waves will record values which approximately fit the definition.

single theodolite observation - The usual type of pilot-balloon observation using one theodolite.

sinking (or downwelling) - 1. A downward movement of surface water generally caused by converging currents or when a water mass becomes more dense than the surrounding water. See upwelling. 2. (atmospheric optics) A refraction phenomenon; the opposite of looming in which an object on or slightly above the geographic horizon apparently sinks below it. Sinking occurs whenever the rate of density with height through the atmosphere is of smaller magnitude than normal or, in extreme cases, where the density actually increases with height.

sky-ground luminance ratio - The ratio of the luminance of the sky to the luminance of the ground.

sky-ground ratio - Same as sky-ground luminance ratio.

slack water (or slack tide) - The interval when the speed of the tidal current is very weak or zero; usually refers to the period of reversal between ebb and flood currents. In some places, slack water occurs near times of high and low water, whereas in other localities the slack water may occur midway between high and low water.

slant path velocity - The mean velocity along one cycle of a sound ray path.

slant range - The line-of-sight distance between a target or other object and a sensor within the atmosphere.

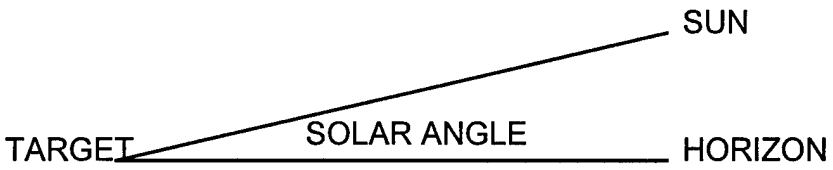
smoothing - An averaging of data in space or time designed to compensate for random errors or fluctuations of a scale smaller than that presumed significant to the problem at hand. For example, a thermometer smoothes the temperature reading on the scale of its time constant.

snow grains - Precipitation of very small white opaque ice particles usually having diameters less than 1 mm.

snowout - The removal of radioactive particles from a nuclear cloud by precipitation when this cloud is within a snow cloud.

snow pellets (or graupel, soft hail) - Precipitation or white, opaque, soft, approximately round ice particles of diameters about 2 to 5 mm.

solar angle (SA) - The angle between the line from the Sun to the ground target and the line from the target to the horizon (contrast with Sun angle).



solar constant - The rate at which solar radiation is received outside the Earth's atmosphere on a surface normal to the incident radiation and at the Earth's mean distance from the Sun. For decades, the tentative result was 1.94 or 1.95 gram-calories per square centimeter per minute; however, recent studies of the infrared and ultraviolet portions of the solar spectrum suggest a value of about 2.00 gram-calories per square centimeter per minute.

solar plasma - 1. A hot mixture of ionized gas and electrons, protons, and alpha particles; an electrically conductive fluid which pervades the inner solar system and through which the inner planets with their atmospheres travel as cold bodies. One portion of this plasma, termed the solar wind, has escaped from the Sun's corona as a result of the extremely high coronal temperature. The solar wind has a temperature of the order of 10^5 °C and travels outward from the Sun at a speed of 300 to 1500 km sec^{-1}. At Earth's distance from the Sun, it has a particle concentration varying from 1 cm^{-3} to 10 cm^{-3}, and is distinct from the plasma components ejected from M-regions and from solar flares. 2. Localized, relatively transient, active regions develop frequently in the solar atmosphere. The number and intensity of these active regions rise and fall in average 11-year cycles, the so-called sunspot cycles. These active regions are the location of sunspots, plages, prominences, strong magnetic fields, increased electromagnetic radiation, and explosive flare events.

3. Flares are sudden bursts of energy emitted as electromagnetic radiation (X-ray, ultraviolet, visible, and radio frequencies) occasionally 1000 times more intense than background radiation. Large flares can also emit streams of energetic particles (mostly protons) both in the form of high speed particles spiraling outward along interplanetary magnetic field lines at speeds approaching the speed of light and as lower energy particle clouds moving outward as a shock front perturbation in the solar wind. High energy particles are often termed solar cosmic rays, and arrive at the Earth's outer atmosphere in 15 minutes to about 24 hours. The low-energy particle cloud normally arrives in 20 to 72 hours.

solar tide - The tide caused solely by the tide-producing forces of the Sun.

sonar - 1. An acronym derived from the expression sound navigation and ranging. The method or equipment for determining by underwater sound techniques the presence, location, or nature of objects in the sea. 2. A system for determining the distance of an underwater object by measuring the interval of time between the transmission of an underwater sonic or ultrasonic signal and the return of its echo.

sonic anemometer - An anemometer which measures wind speed by means of the properties of wind-borne sound waves.

sounding - 1. A measurement of the depth of water beneath a vessel. 2. (geophysics) Any penetration of the natural environment for scientific observation. 3. (meteorology) Same as upper-air observation; commonly connotes a single complete radiosonde observation.

sound speed - The speed with which a sound wave advances through a medium. In the case of a perfect gas medium, substitution from the equation of state gives, in all

$$Y = \frac{\sqrt{(\gamma P)}}{e} = \sqrt{(\gamma RT)}$$

where P is the pressure, R is the universal gas constant for one gram of the gas in question, and T is its absolute temperature. Sound speed is a scalar quantity that has no dependence upon direction at a given point.

sound velocity - 1. The rate of travel at which sound energy moves through a medium; usually expressed in feet per second. 2. The velocity of sound in seawater is a function of temperature, salinity, and the changes in pressure associated with changes in depth. An increase in any of these factors tends to

increase the velocity. Sound is propagated at a speed of 4.742 feet per second at 32 °F, one atmospheric pressure, and a salinity of 35 per mile.

sound waves - Longitudinal pressure waves in any material medium regardless of whether they constitute audible sound. (Earthquake waves and ultrasonic waves are sometimes called sound waves.)

speckel - An optical interference pattern produced by coherent scattering from a diffuse object.

spectral gap - That part of a spectrum which is essentially zero between two finite components.

spectrophotometer - A device for the measurement and analysis of both emitted and absorbed radiant energy. Appropriate identifications of the composition or the constituents of organic and inorganic matter may be made. Quantitative information derived from a determination of the intensity or density of specific spectral lines can also be measured.

spectrum - A visual display, a photographic record, or a plot of the distribution of the intensity of energy dispersion of a given kind as a function of its wavelength, energy, frequency, momentum, mass, or any related quantity.

spectrum density - The mean-square amplitude of the output of an ideal filter with unity gain responding to the oscillation, per unit bandwidth, that is, the limit for vanishingly small bandwidth of the quotient of the mean-square amplitude divided by the bandwidth.

spectrum level - The level of that part of a signal contained with a band 1-cycle per-second wide, centered at the particular frequency. Ordinarily, this level has significance only for a signal having a continuous distribution of components within the frequency range under consideration. The phrase "spectrum level" cannot be used alone, but must appear in combination with a modifier (for example, pressure, velocity, and voltage).

speed of sound - The speed with which a sound wave advances through a medium; a function of the modulus of elasticity of the medium and its density. Can be expressed in terms of the ratio of specific heat at constant pressure to that at constant volume of the medium in question, its gas constant, and its absolute temperature.

squall - An increase in windspeed of at least 15 knots that occurs in less than 1 minute and is sustained at a speed of 20 knots or more for at least 1 minute but not more than 5 minutes.

stable stratification - Having density variations along the axis of gravity, usually implying upward decrease of density, for example, a stratification characterized by static stability.

standard atmosphere - A reference atmosphere obtained by averaging or by arbitrary simplification. Dry standard atmospheres such as the NACA or ICAO frequencies. For radio frequencies up to 20 GHz, a gradient of 12 N-units per 1000 feet of altitude is typical of long-term averages for coastal climates. Refraction under this condition is commonly called standard refraction. The CCIR basic reference atmosphere is defined by

$$n = 1 + 298 \text{ X } 10\ e^{-(h \text{ x } 0.4355)}$$

where h is altitude above sea level in thousands of feet.

standard depth - A depth below the sea surface at which water properties should be measured and reported, either directly or by interpolation, according to the proposal by the International Association of Physical Oceanography in 1936. The accepted depths (in meters) are 0, 10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10 000 to which NODC has added 125, 700, 900, 1100, 1300, 1400, and 1750.

standard deviation (σ) - A measure of dispersion of data points around their mean value. The positive square root of the arithmetic mean of the square root of the arithmetic mean of the squares of the deviations from the arithmetic mean of the population:

$$\sigma = \sqrt{(\frac{1}{n} \Sigma \frac{n}{I} = 1(X_i - \mu)^2)}$$

where μ = population mean, n the size of the population, and x_i the characteristic of the i^{th} member of the population. The standard deviation can be estimated from a sample (n) of observations. This estimate of the standard deviation(s) is

$$\sigma = \sqrt{(\Sigma \frac{(X_1 - X)^2}{n-1})}$$

where $\underline{X}$ is the mean of the observed sample.

standard displacement - The surface displacement of a submarine, exclusive of the water in a nonwatertight structure when fully manned, engined, and

equipped for sea duty. Such displacement includes all armament and ammunition, equipment, provisions for crews, miscellaneous stores, and implements of every description that are intended to be carried in war. Excluded are fuel, lubricating oil, fresh water, or ballast water of any kind. This definition was established by the 1930 London Treaty for the Limitation of Armaments.

standard error of estimate (S) - A measure of the dispersion (scatter) of data points with respect to a curve of regression. S is the positive square root of the arithmetic mean of the squares of the deviations from a curve of regression.

$$S = \sqrt{(\Sigma \frac{d_R^{\,2}}{n})}$$

S is a measure of tracking noise and of the precision. Note that S is not a measure of bias errors and is not a measure of most other systematic errors. See precision.

standard error of mean - A measure of the dispersion of sample means around the population mean that is obtained by dividing the standard deviation (σ) by the square root of the sample size (n). It is estimated by dividing the estimations of the standard deviation(s) by SQRT(n).

standard nonrefracting condition - In acoustics, a hypothetical condition of constant sound velocity in all directions and heights such as would occur in an isothermal atmosphere under a no-wind condition. This condition results in sound rays propagating in straight lines in all directions (that is, nonrefracting).

standard pressure (meteorology) - The arbitrarily selected atmospheric pressure of 100 mb to which adiabatic processes are referred for definition of potential temperatures and equivalent potential temperature. Other pressures may be used as standard for specific purposes.

standard temperature (meteorology) - Has no generally accepted meaning except that it may refer to the temperature at 0 pressure altitude in the standard atmosphere (15 °C).

static stability - The stability of an atmosphere in hydrostatic equilibrium with respect to vertical displacements; usually considered by the parcel method. The criterion for stability is that the displaced parcel be subjected to a buoyant force opposite to its displacement; for example, that a parcel displaced upward be colder than its new environment.

station pressure - The atmosphere pressure at the assigned station elevation.

stationary - Statistics of turbulence are invariant in time.

Stefan-Boltzmann constant - A constant of proportionality between the radiant emittance of a blackbody and the fourth power of the body's absolute temperature.

storm surge (or storm tide, storm wave, tidal wave) - A rise above normal water level on the open coast caused only by the action of wind stress on the water surface. A storm surge resulting from a hurricane or other intense storm also includes a rise in level because of atmospheric pressure reduction and wind stress. A storm surge is more severe when it occurs in conjunction with a high tide.

storm tide - 1. See storm surge. 2. The height of a storm surge (or hurricane wave) above the astronomically predicted level of the sea.

stratopause - The top of the stratosphere (corresponds to the level of maximum temperature at approximately 50 to 55 km).

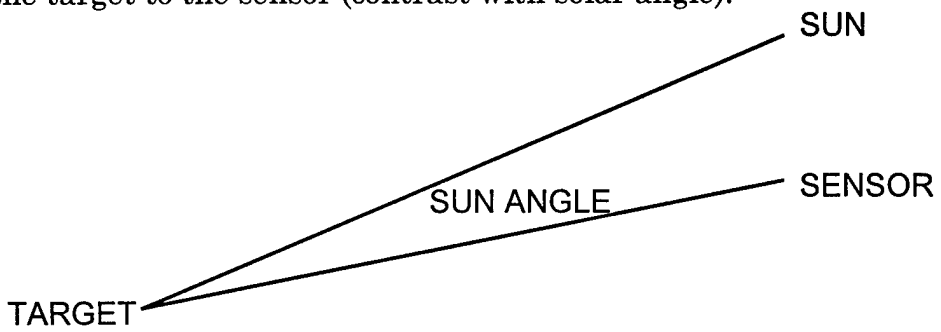
stratosphere - 1. The atmospheric shell above the troposphere and below the mesosphere which extends from the tropopause to the height where the temperature becomes isothermal in the 50 to 55 km region. The temperature in the stratosphere ranges from about -55 to 0 °C. The outstanding feature of the stratosphere's circulation pattern is its persistence. However when changes do occur, they occur rapidly. The composition of stratospheric air is basically the same as that of the lower atmosphere with the addition of ozone. 2. Popularly but erroneously, all the atmosphere above the troposphere.

structure function - The mean square difference of values of some variable of fluid flow, where those values are taken at two points in the flow field. Structure functions are used in describing the transport of such properties as mass, momentum, and heat in turbulent flow. This flow is at once nonlinear, stochastic, and diffusive. In the inertial subrange, a locally isotropic region, its energy is successively transferred in a cascade process to ever smaller eddies. In this region, the structure function takes on a characteristic power-law behavior and has the form of a product of two components. These components are a structure parameter (the average squared field difference) and a power (often taken to be two-thirds) of the length of the separation vector over which the field differences are taken. In practice, this vector is somewhere between a millimeter and a meter in length. The refractive-index-structure parameter C_N^2 (also termed the refractive-index-structure-

coefficient and the optical turbulence coefficient or parameter) is employed in investigations into optical aberrations effected by refractive-index variations in the inertial subrange. Such studies alternatively use the temperature-structure parameter C_T^2, which differs from C_N^2 by a constant.

subrefraction - Refraction less than usual or less than some standard. The standard which is commonly used for radio frequencies up to 20 GHz is a gradient of 12 N-units per 1000 feet altitude.

Sun angle - The angle between the line from the Sun to the target and the line from the target to the sensor (contrast with solar angle).



superrefraction - Refraction greater than usual or greater than some standard.

surf - 1. Collective term for breakers. 2. The wave activity in the area between the shoreline and the outermost limit of breakers.

surf beat - Irregular oscillations of the nearshore water level lasting for periods on the order of several minutes. See beating.

surf zone - The area between the outermost breaker and the limit of wave uprush.

surface anomalies - Irregularities at the Earth's surface, in the weathering zone, or in near surface beds which interfere with geophysical measurements.

surface boundary layer (or surface layer, friction layer, atmospheric boundary layer, ground layer) - The thin layer of air adjacent to the Earth's surface that extends up to the so-called Ekman layer. Within this layer the wind distribution is determined largely by the vertical temperature gradient and the nature and contours of the underlying surface, and the shearing stresses are approximately constant.

surface chart (or sea-level chart) - An analyzed synoptic chart of surface weather observations. Essentially, a surface chart shows the distribution of sea level

pressure which are the positions of highs, lows, ridges, and troughs, and the location and nature of fronts and air masses. Often added to this chart are symbols of occurring weather phenomena, analysis of pressure tendency (isallobars), indications of the movement of pressure systems and fronts, and perhaps others depending upon the intended use of the chart. Although the pressure is referred to mean sea level, all other elements on this chart are presented as they occur at the surface point of observation. A chart in this general form is commonly referred to as a weather map. When the surface chart is used in conjunction with constant pressure charts of the upper atmosphere (for example, in differential analysis), sea-level pressure is usually converted to the height of the 1000 mb surface. Such a chart is then usually called the 1000 mb chart.

surface current - 1. A general term meaning the part of a directly observed movement of water which in nearshore areas does not extend more than 3 to 10 feet (1 to 3 meters) below the surface. In deep or open-ocean areas, surface currents generally are considered to extend from the surface to depths of about 33 feet (10 meters). 2. When surface currents are computed by theoretical methods, the volume of water in the mixed layer (above the thermocline) from the surface to depths of about 165 to 495 feet (50 to 150 meters) generally is referred to as surface current.

surface duct - 1. A zone immediately below the sea surface where sound rays are refracted toward the surface and then reflected. They are refracted because the sound velocity at some depth near the surface is greater than at the surface. 2. The rays alternately are refracted and reflected along the duct to a considerable distance from the sound source.

surge - 1. The name applied to wave motion with a period intermediate between that of the ordinary wind wave and that time of the tide; from about ½ to 60 minutes. It is of low height, usually less the 0.3 foot. 2. Horizontal oscillation of water with comparative short period accompanying a seiche. See storm surge.

survey meter - A portable instrument such as a Geiger counter or ionization chamber that is used to detect nuclear radiation and to measure the dose rate. See monitoring.

swell - Ocean waves which have traveled out of their generating area. Swell characteristically exhibits a more regular and longer period and has flatter crests than waves within the fetch.

target acquisition cycle (classical) - A four-step cycle (after the target area is found): (1) (detection) an object is present; (2) (orientation) the object is approximately symmetric or asymmetric and its orientation may be discerned; (3) (recognition) the class in which the object may be discerned (for example, house, truck, or man); and (4) (identification) the target can be described to the limit of the observers knowledge (for example, motel, pickup truck, or policemen).

Taylor hypothesis - Assumption that the eddies move with the wind speed. With this assumption the transformation from time into the distance may be made by the relation D = U where D is distance, U mean wind speed, and t is time. This relationship refers to the longitudinal direction.

temperature - Heat intensity; for the atmosphere, it is proportional to the kinetic energy of air molecules, and it is expressed in °C or °F. See atmosphere for tabular values. At high altitudes, these values are the effective kinetic temperatures or the molecular-scale temperatures of rarefied gas and are of little significance in terms of the temperature attained by an object in space. The term "temperature" normally refers to the dry-bulb temperature.

temperature inversion - A layer in which temperature increases with altitude. The principal characteristics of an inversion layer is its marked static stability, so that very little turbulent exchange can occur within it. Strong wind shears often occur across inversion layers, and abrupt changes in concentrations of atmospheric particulates and atmospheric water vapor may be encountered on ascending through the inversion. When an inversion is mentioned in meteorological literature and discussion, a temperature inversion is usually meant.

temperature, radiative - The temperature an object appears to have based on the actual radiative emission of energy by the object. It is equivalent to the temperature that an object would appear to have if the object emitted black-body radiation equal to the actual radiative emission.

temperature, radiometric - See temperature, radiative.

terrain correction (or topographic correction) - A correction applied to observed values obtained in geophysical surveys to remove the effect of variations to the observations caused by topography in the vicinity of the sites of observation.

terrestrial radiation (also called eradiation, Earth radiation.) - The total infrared radiation emitted from the Earth's surface including the seas and oceans; to be carefully distinguished from the effective terrestrial radiation, atmospheric radiation, and insolation.

thermal layer - See thermocline.

thermal structure - The temperature variation with depth in seawater.

thermal zero shift - A change in output at zero measure caused by the effects of temperature only. Usually expressed in percentage of full-scale output at room temperature per unit (or interval) of change in temperature.

thermistor - A thermally sensitive resistor whose primary function is to exhibit a change in electrical resistance with a change in temperature. Usually a metallic oxide semiconductor which exhibits a high negative temperature coefficient of resistance change.

thermocline - A vertical negative temperature gradient in some layer of a body of water which is appreciably greater than the gradients above and below it. Also, a layer in which such a gradient occurs. The principal thermoclines in the ocean are either seasonal (caused by heating of the surface water in summer) or permanent.

thermocouple (transducer) - A transducer whose output depends on the production of an emf in two dissimilar metals as a function of the temperature.

thermohaline - Pertaining to both temperature and salinity acting together; for example, thermohaline circulation.

thermohaline circulation - Vertical circulation induced by surface cooling which causes convective overturning and consequent mixing.

thermohaline convection - Vertical movement of water observed with seawater. Such water, because of its decreasing temperature or increasing salinity, becomes heavier than the water underneath it and a disturbed vertical equilibrium results.

thermometric conductivity (K) - The ratio of the thermal conductivity, k, of a substance to the product of its specific heat, c, and its density, ρ.

$$K = k/(C\rho)$$

thermonuclear - An adjective referring to the process (or processes) in which very high temperatures are used to bring about the fusion of light nuclei such as those of the hydrogen isotopes (deuterium and tritium) with the accompanying liberation of energy. A thermonuclear bomb is a weapon in which part of the explosive energy results from thermonuclear fusion reactions. The high temperatures required are obtained by means of a fission explosion. See fusion.

thermosphere - The atmospheric shell extending from the top of the mesosphere to outer space. It is a region of more or less steadily increasing temperature with height starting at 70 or 80 km. The thermosphere includes the exosphere and most or all the ionosphere.

threshold, illumination (I_T) - The minimum energy necessary to illuminate a target so a visual sensor can perceive the target/background scene. Even with sufficient target-to-background contrast, the target/background scene cannot be seen if the illumination is below the sensor's illumination threshold.

thru-put time (computer) - The total elapsed time from the moment the raw data is received until the processed data is delivered to the user. See turnaround time.

tidal current - 1. (or tidal stream) The alternating horizontal movement of water associated with the rise and fall of the tide caused by the astronomical tide-producing forces. 2. In relatively open locations, the direction of tidal current rotates continuously through 360° diurnally or semidiurnally. In coastal regions, the nature of tidal currents will be determined by local topography as well. See flood current, ebb current, reversing current, and rotary current.

tidal movement - The movements which include both the vertical rise and fall of the tide, and the horizontal flow of the tidal currents. This movement is associated with the astronomical tide-producing forces of the Moon and Sun acting upon the rotating Earth.

tide - 1. The periodic rising and falling of the Earth's oceans and atmosphere which results from the tide-producing forces of the Moon and the Sun acting upon the rotating Earth. This disturbance actually propagates as a wave through the atmosphere and through the surface layer of the oceans. 2. Atmospheric tides are always so designated, whereas the term "tide" alone applies to the water level. Sometimes the periodic horizontal movements of the water along coast lines is also called "tide," but it is more correct to designate the latter as tidal current, reserving the term “tide” for the periodic vertical movements.

tide amplitude - One-half of the difference in height between consecutive high water and low water, hence, half of the tide range.

tide curve - A graphic presentation of the rise and fall of tide; time (in hours or days) is represented by the abscissa and height by the ordinate.

tide cycle - A period which includes a complete set of tide conditions or characteristics such as tidal day, lunar month, or Metonic cycle. See tidal current cycle.

tide gage - A device for measuring the height of tide. It may be simply a graduated staff in a sheltered location where visual observations can be made at any desired time, or it may consist of an elaborate recording instrument (sometimes called a marigraph) which makes a continuous graphic record of tide height against time. Such an instrument is usually actuated by a float in a pipe communicating with the sea through a small hole which filters out shorter waves. See automatic tide gage.

tide prediction - Predetermined time and height of high or low water at a reference station. May be computed years in advance by mechanically summing the harmonic constituents of which the tide is composed. Used to compile tide tables.

tide range - The difference in height between high and low waters where the type of tide is diurnal, and the mean range is the same as the diurnal range. See diurnal range.

tide tables - Tables which give daily predictions, usually a year in advance, of the times and heights of the tide. These predictions are usually supplemented by tidal differences and constants by means of which additional predictions can be obtained for numerous other places. See tide prediction.

time - 1. The measurable aspect of duration. Time makes use of scales based on the occurrence of such periodic events as the day, depending upon the rotation of the Earth; the month, depending upon the revolution of the Moon around the Earth; the years, depending upon the revolution of the Earth around the Sun. When it is said it is a certain time, it is expressed as a length on a duration scale measured from an index on that scale. For example, 4 p.m. local mean solar time means that 4 mean solar hours have elapsed since the mean sun was on the meridian of the observer.
2. (apparent solar) Time measured by the apparent diurnal motion of the true Sun. Also termed true solar time and, often, apparent time. At any given instant, the apparent solar time is the hour angle of the true Sun. In civil life, apparent solar time is counted from the two branches of the

meridian through 12 hours. The hours from the lower branch are marked a.m. (ante meridian) while those from the upper branch are marked p.m. (post meridian). In astronomical work before 1925, apparent solar time was counted from the upper branch of the meridian through 24 hours. See astronomical time. Since 1925, the count has been from the lower branch, and the civil day has taken the place of the astronomical day in astronomical work. Naming the meridian of reference is essential to complete identification of the time, for example, 75th meridian apparent solar time, Greenwich apparent solar time, and local apparent solar time which sites the meridian of the observer. Because of variations in the apparent motion of the Sun, a clock or watch cannot be adjusted to show apparent solar time. Time can only be determined by observations on the true Sun like the time shown by a sundial. See time, equation of. 3. (astronomical) Solar time in an astronomical day that begins at noon. It may be either apparent solar time or mean solar time; it is counted from noon in a single series of 24 hours. Astronomical time appears in the American Ephemeris and Nautical Almanac prior to 1925 (in the volumes for 1925 and later, civil time is used instead). 4. (atomic) A uniform time based on atomic resonance. Atomic Time (AT) and ephemeris time are now assumed to be equivalent. See time, ephemeris. 5. (civil) Solar time in a civil day that begins at midnight. It may be either apparent solar time or mean solar time and may be counted in two series of 12 hours each beginning at midnight, marked a.m. (ante meridian) and at noon, marked p.m. (post meridian) or in a single series of 24 hours beginning at midnight. 6. (daylight savings) A substitute for standard time, exactly 1 hour fast on that time. Clocks showing standard time are changed to daylight saving time by moving the hands ahead exactly 1 hour. Until 1942, it was not adopted by the railroads, nor generally through the country, and where adopted, it was for use only during summer months. In 1942, it was adopted by congress for general use and unofficially given the name of war time. The time in a given time belt is identified by the particular designation of the belt, for instance, Eastern Daylight Savings Time, and Central Daylight Savings Time. 7. (ephemeris (ET)) A uniform time based on the motion of the Earth around the Sun. See time; atomic (AT). 8. (equation of) The difference in hour angle between apparent solar time and mean solar time. The Sun is sometimes before or sometimes behind the mean sun by an amount of time that ranges from 0 to about 16 minutes. Since the equation of time may be expressed as a correction to either apparent time or mean solar time, its sign must be carefully observed.
9. (Greenwich civil) - Mean solar time for the Greenwich meridian, counted from midnight. Also called Universal time (UT). Greenwich Civil Time (GCT) is a reference used in the American Ephemeris and Nautical Almanac for 1925 and after. It is counted from midnight through 24 hours.
10. (Greenwich sidereal) (a) the sidereal time for the Greenwich meridian, (b) (local apparent) the apparent solar time for the meridian of the observer, (c) (local mean) the mean solar time for the meridian of the observer,

(d) (local sidereal) the sidereal time for the meridian of the observer, and (e) (mean solar) time measured by the diurnal motion of a fictitious body called the mean sun which is supposed to move uniformly in the celestial equator completing the circuit in one tropical year. Often termed simply "mean time." The mean sun may be considered as moving in the celestial equator and having a right ascension equal to the mean celestial longitude of the true sun. At any given instant, mean solar time is the hour angle of the mean sun. In civil life, mean solar time is counted from the two branches of the meridian through 12 hours. The hours from the lower branch are marked a.m. (ante meridian) and the hours from the upper branch are labeled p.m. (post meridian). In astronomical work before 1925, mean solar time was counted from the upper branch of the meridian through 234 hours. Since 1925, the count has been from the lower branch. Naming the meridian of reference is essential to the complete identification of the time. By using the same reference meridian over a belt or zone of the Earth, watches and clocks are adjusted to show the same mean solar time throughout the area. See time, standard. The Greenwich meridian is the reference for a worldwide standard of mean solar time called Greenwich Civil Time or Universal Time. The mean solar time cannot be determined directly by observation. See time, equation of. 11. (sidereal) Time measured by the apparent diurnal rotation of the true vernal equinox. At any instant, sidereal time is the hour angle of the vernal equinox. It is counted from 0 hours, when the vernal equinox is on the meridian, through 24 hours. Naming the meridian of reference is essential to its complete identification. As a result of small differences between positions of the true and mean equinoxes, sidereal time, like sidereal day, is subject to slight irregularities. The irregularities are absent from "uniform" sidereal time, which is used in rating clocks of the highest precision. 12. (standard) Mean solar time for a selected meridian adopted for use throughout a belt (zone). In the continental United States, the meridians of reference for standard time are 15^0 (1 hour) apart and multiples of 15^0 from the initial (Greenwich) meridian. The standard time for each belt is designated by the number of its meridian and also by some name of geographic significance: 75^{th} meridian or Eastern Standard Time, 90^{th} meridian or Central Standard Time, 105^{th} meridian or Mountain Standard Time, and 120^{th} meridian or Pacific Standard Time. The standard time meridians for Alaska are 150° and 165° west longitude, for Hawaii, 150° west longitude, and for the Philippine Islands, 120° east longitude. Standard time was established in 1883 to correlate train schedules of various railroads over the same areas. The standard time belts were planned to be roughly symmetrical with respect to the meridians of reference and to extend 7.5° to either side. Practical considerations such as the need of time correlation of cities outside the original boundaries of a time belt with the cities within the belt, have caused a gradual shifting of those boundaries until some of them now exhibit large irregularities. See time, daylight saving.

TDL (thermoluminescent dosimeter) - A small personnel monitoring device using a radiation sensitive powder which glows after irradiation.

total dose - The external gamma radiation dose accumulated by a receptor being exposed during radioactive cloud passage for an infinite time in the fallout field.

transitional flow - A type of flow which is usually intermittent at a point or section of the flow (that is, liminar, then turbulent, then liminar). Difficult to scrutinize analytically as well as experimentally.

transmission - The amount of the incident radiation which does not undergo extinction when passing through the atmosphere.

transmission coefficient - A quantity, which is the fraction of the radiation intensity on a medium which remains in the beam after passing through the unit thickness of the medium.

transmissivity (τ) - The ratio of the radiant energy transmitted through part of the atmosphere or other medium to the total radiant energy incident upon a reference point within the atmosphere or other medium ($1 \geq \tau \geq 0$).

transmittance - See transmissivity.

transparency - That property of water which allows it to transmit light of different wavelengths. Transparency sometimes is measured in the percent of radiation that penetrates a distance of 1 meter. (Sometimes expressed as the average depth at which a Secchi disc disappears and reappears.)

triboelectric effect - The separation of electric charges on or near the surface of an object (for example, a PGM) caused by the frictional interaction of the object with the clouds of dust, ice crystals, and precipitation.

tropopause - The boundary between the troposphere and the stratosphere, usually characterized by an abrupt change of lapse rate. The change is in the direction of increased atmospheric stability from regions below to regions above the tropopause. Its height varies from 15 to 20 km in the tropics to about 10 km in the polar regions. In polar regions in winter, it is often difficult or impossible to determine just where the tropopause lies, because under some conditions, there is no abrupt change in lapse rate at any height. It has become apparent that the tropopause consists of several discrete

overlapping "leaves," a multiple tropopause rather than a single continuous surface. In general, the leaves descend in a step-like fashion from the equator to the poles.

troposphere - The portion of the atmosphere from the Earth's surface to the tropopause, that is, the lowest 10 to 20 km of atmosphere. The troposphere is characterized by decreasing temperature with height, appreciable water vapor content, and weather.

trough (meteorology) - An elongated area of relatively low atmospheric pressure; the opposite of a ridge. The axis of a trough is the trough line. This term is commonly used to distinguish the preceding from the closed circulation of a low (or cyclone), but a large-scale trough may include one or more lows, an upper-air trough may be associated with a lower-level low, and a low may have one or more distinct troughs radiating from it.

true wind direction - The direction, with respect to true north, from which the wind is blowing; distinguished from magnetic or relative wind direction. In all standard upper-air and surface weather observations, it is the true wind direction that is reported, usually in terms of tens of degrees in the 360° compass.

tsunami (or tunami, tidal wave, seismic sea wave) - A long-period sea wave produced by a submarine earthquake or a volcanic eruption. It may travel unnoticed across the ocean for thousands of miles from its point of origin and builds up to great heights over shoal water.

turbidity - Reduced water clarity resulting from the presence of suspended matter. Water is considered turbid when its load of suspended matter is visibly conspicuous. All waters contain some suspended matter and are turbid.

turbidity, atmosphere - A measure of the degree to which atmospheric constituents or processes (for example, air molecules; particles such as smoke, dust and haze; and scintillation effects) reduce the transparency of the atmosphere to direct, usually visible or near IR, solar radiant energy. Cloudiness is excluded as an attenuating agent.

turbulence - A state of fluid flow in which the instantaneous velocities exhibit irregular and apparently random fluctuations so that in practice only statistical properties can be recognized and subjected to analysis. These fluctuations often constitute major deformations of the flow and are capable of transporting momentum, energy, and suspended matter at rates far in excess of the rate of transport by molecular diffusion and conduction in a nonturbulent or laminar flow.

turbulent boundary layer - The layer above the laminar sublay where Reynolds stress is at least as important as viscous stress.

turbulent flow - Flow characterized by velocity fluctuations (both parallel and transverse to the mean velocity) superimposed on the mean motion.

type of tide - The characteristic feature of the tide (tidal current) determined from the combination of its diurnal and semidiurnal components. Tides are classified as semidiurnal, mixed, and diurnal, but there are no sharply defined limits separating the groups.

upper air (meteorology) - That portion of the atmosphere which is above the lower troposphere. No distinct lower limit is set, but the term is generally applied to the levels at about 850 mb.

upper-air observation; upper-air sounding - A measurement of atmospheric conditions aloft above the effective range of a surface weather observation. A general term usually applied to those observations which are used in analysis of upper-air charts as opposed to measurements of upper atmospheric quantities primarily for research. Among the elements evaluated are temperature, humidity, pressure (by radiosonde, wiresonde, aircraft observation or kite observation), windspeed, and direction (by winds-aloft observations).

upper atmosphere - The general term applied to the atmosphere above the troposphere. For subdivisions of the upper atmosphere See atmospheric shell.

upwelling - 1. The process by which water rises from a lower to a higher depth usually as a result of divergence and offshore currents. See sinking. 2. Most prominent where persistent wind blows parallel to a coastline so that the resultant wind-driven current sets away from the coast. See Ekman spiral. Constitutes a distinct climatogenetic influence by bringing colder water to the surface. Over the open ocean, upwelling occurs wherever the wind circulation is cyclonic but is appreciable only in areas where that circulation is relatively permanent. Also observable when the southern trade winds cross the equator. 3. Upwelled water, besides being cooler, is richer in plant nutrients, therefore, regions of upwelling are generally also regions of rich fisheries.

uranium - A naturally radioactive element with the atomic number 92 and an atomic weight of approximately 238. The two principle naturally occurring isotopes are the fissionable uranium-235 (0.7 percent of natural uranium) and the fertile uranium-238 (99.3 percent of natural uranium), which by capture of a neutron and a decay sequence yields fissionable plutonium-239. Uranium-234 constitutes a minute fraction.

variable radio-frequency radiosonde - A radiosonde whose carrier frequency is modulated by the magnitude of the meteorological variables being sensed.

variate difference method (or dispersion estimating) - A high-order differences method of numerical calculus for deriving a measure of dispersion analogous to the standard error of estimate. See formula under standard error of estimate.

where n = number of samples in the group, p = the order of the backward difference, i = number of backward differences in p^{th} order column, $\Delta^P Y_i$ = i^{th} backward difference of order p. The order p must be large enough to remove all trend so that successive values are random. Ordinarily p is 3, 5, or 10. The number of samples (n) in a group usually is chosen to be some value between 10 and 100. Ordinarily n is 25.

veering - 1. According to general international usage, a change in wind direction in a clockwise sense (for example, south to southwest to west) in either hemisphere of the Earth; the opposite of backing. 2. According to widespread usage among United States meteorologists, a change in wind direction in a clockwise sense in the Northern Hemisphere, counterclockwise in the Southern Hemisphere; also the opposite of backing.

venting - A rapid release of radioactivity within minutes after an underground explosion which does not continue for hours. Involves the release of short-lived isotopes producing relatively high specific activity.

vertical turbulent flux - Obtained by multiplying the fluctuation of temperature, humidity, and horizontal velocity, by vertical velocity and then averaging over a horizontal flight path (usually 10 km).

viscosity - That property of a fluid whereby it resists deformation. The viscous stress per unit area (τ) is proportional to the velocity gradient, the constant of proportionality being the coefficient of dynamic viscosity (μ). The ratio of the dynamic viscosity to the density (ρ) of the fluid is termed the kinematic viscosity (ν).

visibility - 1. Defined as the greatest distance at which an object of specified characteristics can be seen and identified with the unaided eye under any particular circumstances. 2. The greatest distance in a given direction at which it is just possible to see and identify with the unaided eye in the daytime, a prominent dark object against the sky at the horizon, and at

night, a known, preferably unfocused, moderately intense light source. Visibility is a sensory measurement (that is, an observation) estimated by an individual observer of the visual range. Its data, like those for visual range, fall into two discrete sets whose combination cannot always be defended. Visibility may, moreover, be different numerically from visual range since the former poses the added requirement of recognition of the object, a requirement which may lead to different estimates by different observers. A third quantity, meteorological range, is an instrumental daytime measurement which equates transmissivity to visibility by assuming a constant contrast threshold. Runway visual range, also an instrumental determination, makes this assumption plus the further one of constant illuminance threshold. These four quantities—two sensory observations and two instrumental measurements—are distinct and should not be confused. 3. The observer-to-object distance at which the apparent contrast between the object and its surroundings equals the threshold contrast of the eye necessary for object identification.

NOTE: Problems relating to how far an observator can see through the atmosphere are discussed in many places in meteorological glossaries. For more information see visibility, prevailing visibility, recognition, visual range, visual range formula, night visual range, flux density, runway visual range (RVR), runway visibility (RVV), oblique visual range, airlight, airlight formula (Koschmieder's law), Allard's law, threshold contrast, meteorological range (standard visibility), luminance, illuminance, Bougerr's law, threshold illuminance, background luminance, dark adaptation, visual angle, albedo, cone of vision, contrast, extinction coefficient, attenuation coefficient, absorption coefficient, scattering coefficient, transmission coefficient, and transmissivity.)

visioceilometer - A lidar with the capability of measuring visibility and cloud height.

visual range - The distance, under daylight conditions, at which the apparent contrast between a specified type of target and its background becomes just equal to the threshold contrast of an observer; a function, at the moment of observation, of the atmospheric extinction coefficient, the albedo and visual angle of the target, and the observer's threshold contrast. Under nighttime conditions, the visual range (which may then also be called penetration range or transmission range) is the greatest distance at which a point source of light of a given candle-power can be perceived by an observer under given atmospheric conditions. It is a function of the candle-power of the point source, the extinction coefficient of the atmosphere along the light path, and the threshold illuminance for the observer's eyes and is limited by atmospheric and geometric attenuation of luminous flux density. Since visual range is a sensory measurement, characteristics of individual

observers may vary in threshold contrast (ranging from 0.005 to 5000) by day and in threshold illuminance by night. Because visual range in the daytime is a measure of the atmospheric attenuation of contrast, while at night, it is a measure of the atmosphere's attenuation of flux density, visual range data fall into two essentially different classes. See meteorological range, runway visual range, and visibility.

Von Karman's constant - Constant of proportionality, k, between the mixing length, 1, and the distance, z, from the boundary

$$1 = kz$$

washout - The removal of radioactive particles from a nuclear cloud by precipitation when this cloud is below a rain or snow cloud. See rainout, snowout.

water content - A ratio; 100 multiplied by the weight of water in a bottom sediment sample divided by the weight of the dried sample, expressed as a percentage.

water line - A juncture of land and sea. This line fluctuates as the tide or other changes in the water level occur. Where waves are present on the beach, this line is also known as the limit of backrush (approximately the intersection of the land with the still water level). See shoreline, coastline.

water mass - 1. A body of water usually identified by its T-S curve or chemical content, and normally consisting of a mixture of two or more water types. 2. The terms "water mass" and "water type" have been used loosely and interchangeably in oceanographic literature.

water pocket - A water mass of limited size, frequently in the form of a pocket, having properties different from those of the surrounding water. Water pockets are often located at a meandering boundary where they usually are partly or completely cutoff from the original main body of water.

water sample - A portion of water brought up from a certain depth to determine its composition.

waterspout - Usually, a tornado occurring over water; (rarely) a lesser whirlwind over water, comparable in intensity to a dust devil over land. Most common over tropical and subtropical waters.

water tagging - The process of introducing foreign substances (tracers) into the ocean to detect the movement of its waters by subsequent measurement of the location and distribution of the introduced substance. See tracer.

wave - 1. A disturbance which moves through or over the surface of the medium (in this case, the ocean) with speed dependent upon the properties of the medium. 2. A ridge, deformation, or undulation of the surface of a liquid.

wave crest - The highest part of a wave. Also, that part of a wave above still-water level.

wave decay - The change which waves undergo after leaving a generating area (fetch) and passing through a calm or a region of lighter or opposing winds. In the process of decay, the significant wave height decreases and the significant wavelength increases.

wave direction - The direction from which a wave approaches.

wave generation - 1. The creation of waves by natural or mechanical means. 2. In wave forecasting, the growth of waves caused by wind blowing over a water surface for a certain period of time. The area involved is called the generating area or fetch.

wave group - A series of waves whose direction, length, and height vary only slightly.

wavelengths, far infrared - Electromagnetic radiation between 6 and 15 micrometers (both limits are arbitrary).

wavelengths, infrared (IR) - Electromagnetic radiation between 0.74 and 100 micrometers (upper limit is arbitrary).

wavelengths, microwave (MV) - Electromagnetic radiation between 2 and 6 micrometers (both limits are arbitrary).

wavelengths, near infrared - Electromagnetic radiation between 0.74 and 2 micrometers (upper limit is arbitrary).

wavelengths, submillimeter - Electromagnetic radiation between 100 micrometers and 1000 micrometers (1 mm) (both limits are arbitrary).

wavelengths, ultraviolet - Electromagnetic radiation between 0.001 and 0.4 micrometers.

wavelengths, visible - Electromagnetic radiation between 0.4 and 0.74 micrometers.

wave meter - An instrument used to measure and record wave heights.

wave period - The time, in seconds, required for a wave crest to transverse a distance equal to one wavelength.

wave ray - (or orthogonal) A line drawn everywhere perpendicular to the wave crests on a refraction diagram.

wave recorder - An instrument for recording ocean waves. Most wave recorders are designed for recording wind waves, that is, waves of periods up to above 25 seconds. Others are designed to record waves of longer periods such as tsunamis, seiches, or tides. See tide gage.

wave refraction - 1. The process by which the direction of a train of waves moving in shallow water at an angle to the contours is changed. The part of the wave train advancing in shallower water moves more slowly than the part still advancing in deeper water causing the wave crests to bend toward alignment with the underwater contours. 2. The bending of wave crests by currents.

wave signature - The graph of pressure versus time at a point as a wave passes over it.

wave spectrum - 1. In ocean wave studies, a graph showing the distribution of wave energy (square of wave height) with frequency (1/period). 2. The square of the wave height is related to the potential energy of the sea surface so that the spectrum can also be called the energy spectrum.

wave steepness - The ratio of wave height to wavelength.

wave train - A series of waves moving in the same direction.

wave trough - The lowest part of a wave form between successive wave crests. Also, that part of a wave below still water level.

wave velocity - 1. The speed at which the individual wave form advances. 2. A vector quantity that specifies the speed and direction with which a sound wave travels through a medium.

wet bulb temperature - The temperature a parcel of air would have if cooled adiabatically to saturation at constant pressure by evaporation of water into it with all latent heat supplied by the parcel.

wet deposition - The deposition of radioactive material on the Earth's surface in the presence of precipitation. See rainout, snowout, and washout.

whole body counter - A device used to identify and to measure the radiation in the body (body burden) of humans and animals; uses heavy shielding to keep out background radiation and ultrasensitive scintillation detectors and electronic equipment.

wind - Air in motion relative to the surface of the Earth; understood to be the horizontal component unless otherwise specified. Direction is usually measured in degrees from true north, speed in m sec^{-1} or knots.

wind chill - That part of the total cooling of a body caused by air motion.

wind-chill factor - See wind-chill index.

wind-chill index (also called wind-chill factor) - The cooling effect of any combination of temperature and wind expressed as the loss of body heat in km calories per hour per square meter of skin surface. The wind-chill index is based on the cooling rate of a nude body in the shade and is only an approximation because of individual body variations in shape, size, and metabolic rate.

wind direction - The direction from which the wind blows.

wind drift - The portion of the total vector drift of sea ice from which the effects of the current have been subtracted. See drift current and wind-driven current

wind-driven current (or wind drift, drift current) - A current formed by the force of the wind. Theoretically, currents produced by the wind will set to the right of the direction of the wind in the Northern Hemisphere and to the left in the Southern Hemisphere. See Ekman spiral.

wind mixing - Mechanical stirring of water caused by motion induced by the surface wind; similar to mechanical mixing.

wind rose - 1. A diagram showing the relative frequency of winds blowing from different directions. It may also show average speed or frequency of occurrence of various speeds from different directions. 2. A diagram showing the average relation between winds from different directions and the occurrence of other meteorological phenomena such as rain. 3. Any one of a class of diagrams designed to show the distribution of wind direction experienced at a given location over a considerable period, thereby, showing the prevailing wind direction. The most common form consists of a circle from which 8 or 16 lines emanate, one for each compass point. The length of each line is proportional to the frequency of wind from that direction, and the frequency of calm conditions is entered in the center. Many variations exist. Some indicate the range of wind speeds from each direction and some relate wind directions with other weather occurrences.

winds aloft - Generally, the wind speed and wind directions at various levels in the atmosphere above the domain of surface weather observations.

winds aloft hodograph - A vector head-to-tail plot of pibal or radar winds aloft observations.

winds-aloft observation - The measurement and computation of wind speed and wind directions at various levels above the surface of the Earth. Among the methods employed are visual tracking by theodolite of ascending balloons, the use of a radio direction finder to track the radio signals emitted by an ascending radiosonde or other type of transponder, and the use of radar to track a free-floating radar target, sometimes in combination with a radiosonde. The tracking of high-altitude, constant-level balloons (transonde) may be considered to fall within this group. Winds-aloft data are included in many aircraft observations, particularly in aircraft weather reconnaissance flights.

wind setup - 1. The vertical rise in the still water level on the leeward side of a body of water caused by wind stresses on the surface of the water. 2. The difference in still water levels on the windward and the leeward sides of a body of water caused by wind stresses on the surface of the water. 3. Synonymous with wind tide. Wind tide is usually reserved for use on the ocean and large bodies of water. Wind setup is usually reserved for use on reservoirs and smaller bodies of water. See meteorological tide.

wind shear - The local variation of the wind vector or any of its components in a given direction. The vertical shear can be expressed in terms of height sv/sz or of pressure sv/sp as the vertical coordinate.

wind stress - The force per unit area of the wind acting on the water surface to produce waves and currents; its magnitude depends on the windspeed, air density, and roughness of the water surface.

wind tide - See wind setup, meteorological tide.

wind vane - An instrument used to indicate wind direction. Consists basically of an asymmetrically-shaped object mounted at its center of gravity about a vertical axis. The end which offers the greater resistance to the motion of air moves to the downwind position. The direction of the wind is determined by reference to an attached oriented compass rose. The direction is frequently telemetered by use of a nine-light indicator or by use of synchros.

windward - The direction from which the wind is blowing.

wind wave - A wave resulting from the action of wind on a water surface. While the wind is acting on it, it is a sea, thereafter, a swell. See fetch.

wiresonde - An atmospheric sounding instrument which is supported by a captive balloon and used to obtain temperature and humidity data from ground level to a height of a few thousand feet. Height is determined by means of a sensitive altimeter or from the amount of cable released and the angle which

the cable makes with the ground. The information is telemetered to the ground station through a wire cable.

WMO code - An international nomenclature adopted by the World Meteorological Organization for use by all reporting nations.

x-ray - Penetrating electromagnetic radiation emitted when the inner orbital electrons of an atom are excited and release energy. Thus, the radiation is nonnuclear in origin and is generated by bombarding a metallic target with high-speed electrons.

yield - The total energy released in a nuclear explosion; usually expressed in equivalent tons of TNT (the quantity of TNT required to produce a corresponding amount of energy). Low yield is generally considered to be less than 20 kilotons, low intermediate yield from 20 to 200 kilotons, and intermediate yield from 200 kilotons to 1 megaton. There is no standardized term to cover yields from 1 megaton upward.

zenith - 1. The point that lies directly above an observer. 2. The point of the sky in the vertical produced upwards from the observer.

zonal wind - The wind or wind component along the local parallel of latitude, as distinguished from the meridional wind. In a horizontal coordinate system fixed locally with the x-axis directed eastward and the y-axis directed northward, the zonal wind is positive if it blows from the west and negative if from the east.