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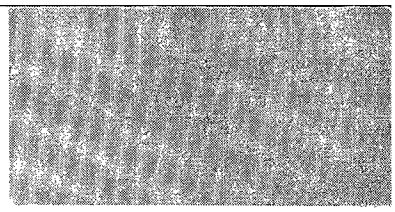

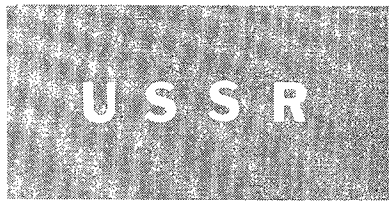

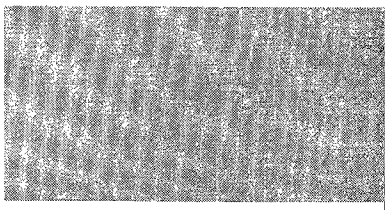

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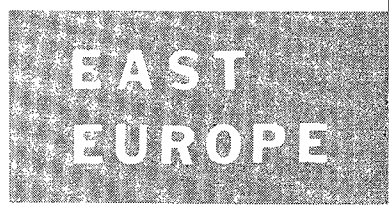

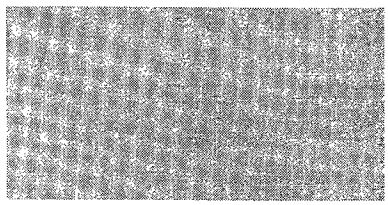

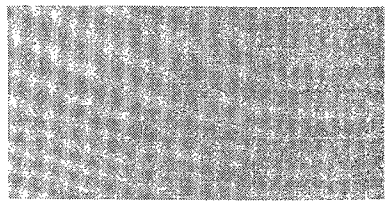

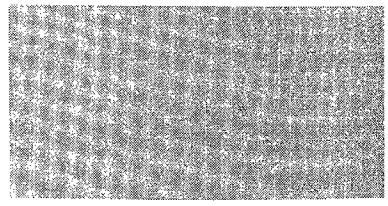

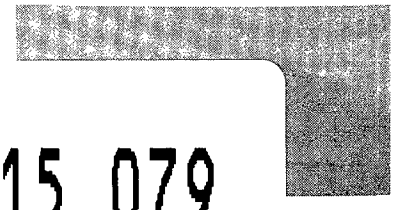

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GEOPHYSICS, ASTRONOMY AND SPACE

No. 411

This serial publication contains abstracts of articles and news items from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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I. ASTRONOMY

Abstracts of Scientific Articles

RADIATION COOLING IN PLANETARY ATMOSPHERES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 236, No 6, 1977 pp 1334-1337

[Article by Corresponding Member USSR Academy of Sciences K. Ya. Kondrat'yev, N. I. Moskalenko and V. F. Terzi, "Radiation Cooling in the Atmospheres of Mars, Venus and Jupiter"]

[Abstract] In this study the authors have investigated the vertical profiles of the fluxes of descending $F\downarrow(z)$, ascending $F\uparrow(z)$ thermal radiations, radiant heat influxes $F(z)$ and rates of radiation cooling $\partial T(z)/\partial t$ (z is altitude, t is time) for different states of the atmospheres of Mars, Venus and Jupiter. Also examined are the influence of different factors (vertical temperature profile $T(z)$, chemical composition, albedo and altitudes of the lower z_0' and upper z_0'' boundaries of the cloud cover, degree of turbidity and concentration of small atmospheric components) on $F(z)$ and $\partial T(z)/\partial t$. In computing the rate of radiation cooling the integration of the spectral fluxes of descending and ascending radiations was carried out in the region taking in virtually all the spectral range of thermal radiation. The spectral transmission functions were computed by the one-parameter method of an equivalent mass for the atmospheres of Mars and Jupiter and a two-parameter method of an equivalent mass for the Venusian atmosphere. Figure 1 in the text shows the dependence of fluxes of ascending and descending thermal radiation and the profile of radiation change of temperature for two models of the Martian atmosphere. Figure 2 shows the profile of radiation change in temperature above and below the Venusian clouds. In the case of Jupiter it was found that near the clouds the rate of radiation cooling or warming is very small (in the range of pressure change 3-0.5 atm). Above the level with a pressure $P(z) < 0.5$ atm the partial pressure is determined by the saturation conditions and at altitudes 30-40 km above the clouds the rate of radiation cooling assumes a maximum value, attaining $1.5 \cdot 10^{-2}$ degree/day. At altitudes > 50-60 km there is radiation warming with a maximum $\partial T(z)/\partial t = 0.035$ degree/day at altitudes 90-100 km above the clouds. Depending on the model of chemical composition and the vertical T profile, the effective temperature of outgoing thermal radiation of Jupiter varies in the range 120-140°K.
[92]

SIGNIFICANT FACTORS IN ELEVEN-YEAR COSMIC RAY CYCLE

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA FIZICHESKAYA in Russian Vol 41, No 9, 1977 pp 1746-1756

[Article by T. N. Charakhch'yan, Scientific Research Institute of Nuclear Physics, Moscow State University, "Role of Active Regions and the Sun's General Magnetic Field in the Eleven-Year Cycle of Cosmic Rays"]

[Abstract] The author has investigated the relationship between the intensity of galactic cosmic rays and the spot-forming cycle of solar activity, the effects in cosmic rays during a period of pole reversal of the sun's general magnetic field, effect of active regions on cosmic rays, near and distant zones of cosmic ray modulation, and characteristics of the energy dependence of the coefficient of modulation of the 11-year cycle of cosmic rays. It follows from this analysis of data on the time dependence of the intensity of cosmic rays and the parameters of solar activity that in the modulation of cosmic rays there is no simple summation of the effects from plasma streams from active regions on the sun and the sun's dipole field. Processes of interaction between plasma streams and the sun's dipole field are important for the modulation of cosmic rays. This interaction can take place, for example, by means of shock waves forming during the motion of hot plasma through the heliomagnetosphere. In this case the dependence of cosmic ray intensity on the heliographic latitude of spots can be caused by the dependence of the conditions for formation of shock waves on the angle between the direction of motion of plasma and the lines of force in the sun's dipole field. The interaction effects are important beyond the earth's orbit, on the periphery of the heliomagnetosphere. It is therefore natural that the Galactic magnetic field plays an important role in them. [This paper is from the materials of the Eighth International Seminar "Active Processes on the Sun and the Problem of Solar Neutrinos," Leningrad, 25-27 Sep 1976.]
[83]

REVIEW OF NEUTRINO ASTROPHYSICS

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA FIZICHESKAYA in Russian Vol 41, No 9, 1977 pp 1916-1948

[Article by G. Ye. Kocharov, Physical-Technical Institute, "Neutrino Astrophysics"]

[Abstract] In this review of the status of neutrino astrophysics it is established that standard models of the sun for high-energy neutrinos give fluxes which considerably exceed the experimentally determined upper limit. For bringing theory into agreement with experimental data it is possible to propose a number of possibilities, each of which to one degree or

another pertains to changes in modern concepts concerning the structure and evolution of stars similar to the sun, on neutrinos as an elementary particle, on the properties of plasma under the specific conditions of the sun's deep layers, etc. Models of the sun with a rapidly rotating core and continuous mixing in all probability do not conform to reality since they are based on the assumption of the presence on the sun of a considerable asphericity, which is not confirmed by the latest experimental data. At the same time, these models are not able to eliminate completely the discrepancy between theoretical and experimental data on solar neutrinos. Hypotheses about the presence of quarks, black holes, a strong magnetic field and a great magnetic moment of neutrinos and that there is a genetic relationship of strong interaction with weak and gravitational phenomena, as well as the hypothesis of a change in the gravitational constant with time and that there are no beta-decay neutrinos are proposals which seem too extravagant and their acceptance is in no way justified by available experimental data. The oscillation hypothesis can be experimentally checked. This hypothesis is fundamental for the physics of elementary particles. The hypothesis of radioactive decay not only violates the rigor of the theory of weak interaction, but also seems too artificial. It cannot be precluded that simple nuclear reactions are responsible for the neutrino paradox. The most attractive hypotheses at the present time are those of jumplike mixing in the solar interior, deviation of the distribution of pairs of particles from Maxwellian, a major role of ^{3}He in the energy release of the sun, the difference in the chemical compositions of the solar surface and interior in its different variants. The first three hypotheses in one way or another are related to the great role of ^{3}He in the evolution and structure of the sun. [This paper is from the materials of the 8th International Seminar "Active Processes on the Sun and the Problem of Solar Neutrinos," Leningrad, 25-27 Sep 1976.]
[83]

II. METEOROLOGY

Abstracts of Scientific Articles

METHOD FOR DETERMINING TEMPERATURE INVERSIONS BY REMOTE SOUNDING

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1090-1093

[Article by M. I. Sumin and A. V. Troitskiy, Gor'kiy Radiophysics Scientific Research Institute, "Possibilities of Determining Temperature Inversions in Ground Remote Sounding of the Atmosphere in the O_2 Absorption Band $\lambda \sim 5$ mm"]

[Abstract] The problem of analyzing the possibilities of determining the fine structure of the atmosphere from ground radiometric measurements in the region $\lambda \sim 5$ mm includes 2 points: 1) solution of the direct problem for clarifying the influence of inversions on the radio characteristics of the atmosphere; 2) carrying out of numerical experiments for reconstructing the temperature profile and carrying out reconstructions of atmospheric radiation from radiometric measurements in the presence of inversion situations. The authors examine the dependence of atmospheric brightness temperature on zenith angle for a number of frequencies in the range $\nu \sim 53$-56 GHz for a noninversion distribution of meteorological elements and for the case of a surface inversion. The presence of surface inversions $\Delta T \sim$ 3-5°K exerts an influence on the nature of the dependence of $T_{br\,\nu}$ on θ. These changes are manifested most clearly at 53-55 GHz, where the curves of the dependence $T_{br\,\nu}(\theta)$ have clearly expressed maxima whose value is dependent on the thickness and location of the inversion. However, at $\nu =$ 55 GHz the changes are more detailed and have the best angular resolution. Inversions of the uplifted type (at altitudes to 2 km) to a lesser degree influence the dependence $T_{br\,\nu}(\theta)$, but the fact of presence of an inversion is still detectable. (For the case of a surface inversion the changes in brightness temperature are $\sim$1.5-4°K; in the case of an uplifted inversion the corresponding brightness temperature changes are $\sim$0.5-1°K; the contribution of high (above 2 km) inversions to atmospheric radio emission does not exceed tenths of a degree.) It is shown that the choice of a sounding frequency in the region $\gamma \approx 54.5$ GHz is optimum in remote sounding under these conditions. Variations of the T(h) profile at altitudes greater than 4 km exert a very small influence on atmospheric brightness temperature in the region $\lambda = 5$ mm.
[98]

III. OCEANOGRAPHY

News

TSUNAMI WAVE PREDICTION

Moscow SOVETSKAYA ROSSIYA in Russian 13 Nov 77 p 4

[Article by V. Anikeyev, "Intercepting Tsunamis"]

[Summary] Specialists are having increasing successes in predicting the occurrence of tsunamis. A. Ye. Svyatlovskiy and B. I. Silkin have commented on the state of the art. Science now has the means for calculating the velocity of tsunami movement. It is equal to the velocity of a jet aircraft: 700-800 kilometers per hour. Little time remains for man to take the necessary measures. But, fortunately, the warning signal travels two or three times more rapidly. The warnings are carried by oscillations propagating in the earth's solid crust. At different places in the Kuriles (such as Paramushir, Kunashir and Iturup Islands) and in the Far East units have been established to warn of tsunami onslaughts. They are charged not only with the responsibility of issuing warnings, but also safe evacuation of the population. There are rigorous instructions which regulate the actions of responsible parties during alarm periods. At the Sakhalin Administration of the Hydrometeorological Service there are oceanologists who remain on duty 24 hours a day. Upon receiving a signal that an earthquake has occurred somewhere, specialists immediately make complex computations, after which specialists can draw a conclusion as to whether this is a tsunami or a regular wave. The outpost for these observations is the observatory on Shikotan Island. The highest hopes for a more precise forecast are pinned on this observatory. In tsunami forecasts much attention is devoted to the automation of operations. Work on this project is being carried out at the Sakhalin Multidiscipline Scientific Research Institute. Specialists there have developed a new computer and special algorithms are being prepared for use with the computer. It is hoped that the system will be tied into the corresponding American system. It is very important that the electronic computers of the two countries be able to talk in the same mathematical language. This will make it possible for Soviet and American specialists to exchange routine data and more precisely predict the possibility of the appearance of tsunamis. Soviet and American specialists have worked together on the scientific research ship "Valerian Uryvayev." The results of these

investigations have been extremely productive. Much attention was devoted to the problem of the occurrence of tsunamis, the mechanism of energy transfer from the ocean floor to the water. The waves from frequent earthquakes arising within the confines of the Kurile-Kamchatkan trench reach our territory far more quickly than they reach the shores of the United States. Up to now there has not been a single case when the Soviet tsunami service has failed to warn the population about a tsunami. But unfortunately, there have been many false alarms. It is hoped that the false alarm problem will be solved by means of the new computer complex at the Sakhalin Institute.
[100]

Abstracts of Scientific Articles

SCATTERING OF MODULATED RADIATION ON STATISTICAL OBJECTS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1025-1033

[Article by L. S. Dolin, Gor'kiy Scientific Research Radiophysics Institute, "Scattering of Sinusoidally Modulated Radiation on Statistical Objects"]

[Abstract] It is shown that during the scattering of sinusoidally modulated radiation fluxes in the volume of a turbid medium or a rough surface the effect of spatial inhomogeneities of the scattering index of the medium and also albedo inhomogeneities and unevennesses of the profile of surface roughness on the flux envelope is described by known expressions of the theory of wave scattering on three- and two-dimensional diffraction gratings. In a case when these characteristics of the scattering objects form homogeneous random fields, the angular dependence of the mean square of intensity of modulation of the scattered flux reproduces the spectra of the spatial correlation functions of these fields.
[98]

DIVERGENCE OF MASS FLOW IN FIELD OF DEEP CURRENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1055-1065

[Article by V. Kh. Yenikeyev and M. N. Koshlyakov, Institute of Oceanology, "Divergence of Mass Flow in Field of Deep Currents in Tropical Atlantic"]

[Abstract] This is essentially a continuation of other studies published by the authors (M. N. Koshlyakov, et al., IZV. AN SSSR, FAO, 10, No 1, 1974; V. Kh. Yenikeyev, et al., OKEANOLOGIYA, 13, No 6, 1973). Here it is shown that the regime of deep large-scale geostrophic currents in the tropical Atlantic is essentially different from an isopycnic layer. A good approximation to an isopycnic state cannot be achieved by variation of the

density field within the limits of the errors in its construction on the basis of experimental data. It can be postulated that the basic mechanism of formation of significant mass flows in the ocean depths is associated with synoptic eddies in the open ocean. The results of computations of the large-scale system of currents in the tropical Atlantic, carried out on the basis of the stipulated density field under the condition of non-through flow for the total flow on the "solid" boundaries of the ocean to all intents and purposes satisfy the condition of a minimum of divergence of mass flow (with the same density field). This result can be regarded as a strong indirect argument in favor of the reality of the pattern of deep currents found in the earlier studies and in favor of diagnostic methods for computing deep ocean currents in general.
[98]

INTEGRAL MODEL OF ACTIVE LAYER OF OCEAN

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1034-1043

[Article by S. A. Arsen'yev and A. I. Fel'zenbaum, Institute of Oceanology, "Integral Model of Active Layer of Ocean"]

[Abstract] The authors examine the nonstationary one-dimensional model of the active layer of the ocean. For closing the problem use is made of the equation for the balance of turbulent energy in integral form. The problem of determining integral dissipation is solved using similarity theory and some additional considerations, including the Ekman theory of purely drift currents. The theory is illustrated by two examples. In the first a study is made of a storm, whereas in the second a study is made of the annual variation on the basis of the known wind and heat flow at the ocean surface.
[98]

STATISTICAL CHARACTERISTICS OF UNDERWATER ILLUMINATION

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1074-1080

[Article by V. P. Nikolayev and O. I. Prokopov, Southern Division, Institute of Oceanology, "Correlation Between the Statistical Characteristics of Underwater Illumination and Some Conditions for Illumination of the Sea Surface"]

[Abstract] The authors give an analysis of the results of experimental investigations of fluctuations of underwater illumination. There was found to be a significant dependence of the statistical characteristics of underwater illumination on solar zenith angle and on the orientation of the solar vertical relative to the direction of wave propagation. This dependence fits in with the idea that the principal factor causing fluctuations of underwater illumination is the focusing of sunlight after refraction on the wave-covered sea surface.
[98]

ISOPYCNIC CHARACTERISTICS OF HORIZONTAL SURFACES IN OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 237, No 1, 1977 pp 207-210

[Article by L. I. Galerkin and I. M. Belkin, Institute of Oceanology, "Evaluation of Isopycnicity of Horizontal Surfaces in Ocean"]

[Abstract] Temperature (T) and salinity (S) can be regarded as two independent parameters of the state of sea water. The field T is formed as a result of heat exchange processes and the S field as a result of moisture and salt exchange at the boundaries of the ocean and within it. In an analysis on horizontal surfaces the dependence between water density and pressure can be considered everywhere identical and without great errors it can be assumed that density is dependent only on T and S. The results of an analysis of the two-dimensional probability distribution p(T,S) for the surfaces of the oceans gave values of the correlation coefficient r between T and S in the range 0.50-0.66 for the ocean and 0.80 for the South Pacific. If for any set T and S r = +1, the relief of the function of the two-dimensional distribution of probabilities p(T,S) should degenerate into a line coinciding with one of the ρ(T, S) isolines. When r = -1 p(T,S) also is elongated into a line which with an identical region of its determination intersects the maximum (in comparison with $0 > r > -1$) number of isopycnic lines and is perpendicular to them at each point of intersection. When r = +1 the entire T and S set must be on the same isopycnic surface. In addition, when r = ±1 each T value in a given set must correspond to a unique S value. In order to check these conclusions, the authors prepared a program and carried out computations of the distribution of functions p(T,S)on different horizontal surfaces for the entire depth of the oceans. In all the oceans there is invariably an r maximum in the surface structural zone at depths precisely corresponding to the core of the subsurface $\overline{S}$ maximum: in the Atlantic and Pacific Oceans at 150 m r = 92.3% and r = 81.6%, and in the Indian Ocean r = 86.5% at 200 m. In the intermediate waters r is minimum: 74.1 and 4.8% at 800 m in the Atlantic and Pacific Oceans and 38.8% in the Indian Ocean. In the deep waters of the Atlantic and Indian Oceans r increases to the deep maximum at 4,000 m (96.4 and 72.4%).
[91]

ACOUSTIC EFFECT OF FINE STRUCTURE OF OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 237, No 1, 1977 pp 56-59

[Article by I. G. Malkina, Pacific Ocean Oceanological Institute, Far Eastern Scientific Center, "Acoustic Effect of Fine Structure of the Ocean in the Presence of a Sound Channel"]

[Abstract] From the point of view of acoustics, the presence of a fine structure of temperature and salinity leads to the existence of a similar structure of the speed of sound c field. The fine structure of c exerts a specific influence on the propagation of sound waves. This article examines the acoustic effect of the fine structure in the presence of a sound channel. It is shown that the fine structure can lead to some decrease in the characteristic horizontal scales of the sound field pattern. Since fine-structure layers with a vertical thickness of about 1-10 m have relatively small horizontal dimensions, the author examines a model of the ocean with the following dependence of the speed of sound on depth z and the horizontal coordinate x: $c = c_0(z)+c_1(z,x)$, where $c_0(z)$ is the large-scale speed of sound profile, $c_1(z,x)$ is the fine structure. It is shown that the presence of the fine structure leads to the appearance of regular and irregular increments to the phase of the normal wave. Then it is shown that the phases of all normal waves during propagation through a channel with a fine structure have a regular positive correction. Thus, the spectrum of the field is displaced in the direction of greater space frequencies. Since all the corrections are positive, there will be an effect of horizontal field compression.
[91]

IV. TERRESTRIAL GEOPHYSICS

News

SADOVSKIY DISCUSSES EARTHQUAKE PREDICTION WITH SEISMOLOGISTS

Moscow PRAVDA in Russian 20 Nov 77 p 3

[Article by V. Gubarev, "At the Sources of an Earthquake"]

[Summary] A discussion of earthquake prediction and related topics took place in the office of the Director of the Institute of Physics of the Earth Academician M. A. Sadovskiy. One of the participants, I. L. Nersesov, head of the seismology section at the institute, stated that in actuality the impression has become widespread that there has been a marked intensification in seismic activity recently. But this is a purely subjective impression, he adds, since during the past year there were only two more earthquakes than usual. What has happened is that recently many strong earthquakes have been near populated places. Academician Sadovskiy interjected that some specialists have been trying to relate the frequency of earthquakes to human activity. In general, he notes, human activity cannot affect seismic activity, although the filling of the Nurekskoye Reservoir, for example, caused an appreciable increase in earthquake activity in that region. Another participant in the discussion, Doctor of Physical and Mathematical Sciences V. I. Myachkin, argued that earthquake prediction was somewhat akin to meteorological forecasting and that there was a need for broadening the observational base, but Academician Sadovskiy protested that the analogy was a poor one. In meteorology, he said, the situation is a highly volatile one, with conditions literally changing from hour to hour, and therefore meteorological forecasting is more complex than earthquake prediction. A. V. Drumya, Corresponding Member Moldavian Academy of Sciences, commented on the Carpathian earthquake of 4 March 1977. It was difficult to predict because the focus was situated at a depth of 100-120 km and its influence extended for thousands of kilometers. In such cases qualitatively different factors are involved than in "surface" earthquakes. Among the earthquake precursors which should be registered are electromagnetic phenomena. The areas where earthquakes can be expected in the next two or three years should be defined and detailed observations should be carried out in such

locales. With respect to protecting the population, earthquake prediction is only half the job. The powerful earthquakes in Rumania in March and in the Kyzylkum on 14 July had virtually no effect on Kishinev and Gazli due to the fact that the city buildings were designed to absorb such shocks. During the first tremor during the past year many structures in Gazli were destroyed. Now this did not occur because during construction the requirements of seismologists were taken into account. Sadovskiy feels sure that in the future scientists will be able to exert a direct effect on earthquake foci. For example, when it is known precisely where seismic energy has accumulated it will be possible to drill a borehole there and pump water into it under a high pressure. Or a powerful explosive is lowered into a borehole and is detonated. The additional stresses in the rock caused by the pumping in of water or an explosive wave will exceed its strength and cause an earthquake. In this way it will be possible to avoid the most terrible aspect of an earthquake -- its unexpected occurrence.
[95]

Abstracts of Scientific Articles

DEFORMATION RATES IN SEISMIC FLOW OF ROCK MASSES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 10, 1977 pp 34-47

[Article by Yu. V. Riznichenko, Institute of Physics of the Earth, "Computation of Deformation Rates in Seismic Flow of Rock Masses"]

[Abstract] Proceeding on the basis of the concepts of the tensor of the seismic moment for a three-dimensional focus of an earthquake of the shearing type and the parameters of long-term mean seismicity, the author has derived computation formulas for the tensor of the rate of deformation in the seismic flow of rock masses in a three-dimensional case. The article discusses the possibilities of mapping the indices of seismic flow in an investigation of the geodynamics of seismic regions. The basic result of the mentioned studies are the mentioned formulas, which afford a practical possibility for establishing the seismic flow parameters using quantitative data on long-term mean seismicity (seismic activity, maximum possible earthquakes, etc.) and on the directions of the dilatation and compression axes at the foci obtained in study of the focal mechanism. The expressions cited here for the vertical component are refinements of approximate formulas derived earlier in the elementary theory of vertical seismotectonic movements. The computation formulas were derived for the horizontal components for the first time.
[88]

EARTHQUAKE CLASSIFICATION

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 10, 1977 pp 48-53

[Article by D. N. Rustanovich, Institute of Physics of the Earth, "Earthquake Classification"]

[Abstract] The vast number of seismograms collected during recent years has made it possible to find definite patterns in the formation of the wave pattern and the corresponding Fourier spectra. The author here makes an attempt to examine these patterns in order to ascertain whether it is possible to establish a definite classification of wave patterns for near earthquakes with the geological conditions of the medium taken into account. It was found that for oscillations caused by earthquakes in the epicentral zone there will be "standard" oscillations in the intensity range from 3 to 7-8 scale units. Each epicentral zone is characterized by its own type of oscillations. The similarity in the form of oscillations and their spectral peculiarities persists almost stably with time both in aftershocks and in earthquakes separated by several decades in time. In the course of the investigations the four most characteristic types of earthquakes were determined. The stability of types of oscillations with time in a broad range of earthquake intensity indicates either a stability of the nature of the focal processes determining the radiation of seismic energy or a predominant influence of structure of the medium on formation of the signal reaching the earth's surface. The classification of oscillations (in combination with allowance for the geological conditions of the covering medium) affords prospects for a new approach to solution of problems in engineering seismology and seismic regionalization of local zones.
[88]

ASPECTS OF THREE-DIMENSIONAL INVERSE PROBLEM OF GRAVITY POTENTIAL

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 237, No 1, 1977 pp 48-51

[Article by P. I. Balk, Siberian Power Institute, Siberian Department USSR Academy of Sciences, "On the Problems of Uniqueness and Equivalence in the Three-Dimensional Inverse Problem of Gravity Potential"]

[Abstract] One of the fundamental problems in gravimetry is the solvability of the inverse potential problem. A full solution of this problem is closely related to the problem of the relationship between the structure of external gravitational fields and the structure of distribution of anomalous sources. The author feels that for the still poorly studied class of three-dimensional problems with variable densities it is useful to study these problems in specific model classes of sources. Accordingly, the article examines an infinite class of distributions of field sources in a volume V(R) of hemispherical configuration with a fixed radius R. A formula is derived for solving the inverse problem in the considered class of potentials distributed on a plane $z = 0$ and it is shown how expressions can be derived for explicitly determining the structure of a family of equivalent distributions.
[91]

MODEL STUDY OF EFFECT OF SINUSOIDAL LAYER BOUNDARY ON RAYLEIGH WAVES

Baku IZVESTIYA AKADEMII NAUK AZERBAYDZHAN SSR, SERIYA NAUK O ZEMLE in Russian No 1, 1977 pp 108-111

[Article by R. D. Dzhafarov and R. D. Kuliyev, "Model Study of the Influence of a Sinusoidal Free Boundary of a Layer on Rayleigh Wave Dispersion"]

[Abstract] This paper presents the results of a study (using models) of the influence of structural inhomogeneity of the medium on the propagation of surface Rayleigh waves. As the inhomogeneous two-dimensional model the authors used a layer lying on a half-space and having a sinusoidal profile of the free surface. In the adopted model the wavelength of the structural inhomogeneity of the free surface is assumed to be commensurable with the length of the Rayleigh wave. The model is fabricated of plexiglass (layer) and texolite (half-space) and corresponds with respect to similarity criteria to the earth's crust and mantle. On a surface of a horizontal layer with a thickness 1.8 cm the authors cut a sinusoid with a wavelength λ_S = 3 cm, equal to the length of the Rayleigh wave λ_R in the plexiglass with a dominant period 25 μsec; the amplitude of the sinusoid was selected in such a way that the mean thickness of the sinusoidal layer differed from the thickness of the horizontal layer. For a layer on a half-space having a sinusoidal free surface with different relationships of the wavelength of the sinusoid and the length of the Rayleigh wave the experimental dispersion curves are situated below the corresponding curve for the mean layer. The curve for the case $\lambda_S = \lambda_R$ is situated lower than for the case $\lambda_S = 1/2\,\lambda_R$ with identical thickness H_{mean}.
[84]

MAGNETOVARIATION INVESTIGATIONS OF RUSSIAN PLATFORM

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 9, 1977 pp 107-112

[Article by I. I. Rokityanskiy, I. M. Logvinov, V. M. Maksimov, D. A. Rokityanskaya, Yu. G. Shigayev and M. G. Shul'man, Geophysical Institute Ukrainian Academy of Sciences, "Areal Magnetovariation Investigations in the Central Part of the Russian Platform"]

[Abstract] During the period 1 July-20 August 1975, working in the central part of the Russian Platform, personnel of the Geophysical Institute of the Ukrainian Academy of Sciences carried out the first Soviet areal investigations of conductivity anomalies. This work was done in collaboration with scientists of Voronezh University, who earlier had carried out magnetovariation observations at 22 stations along two regional profiles and over the area of the Voronezh crystalline complex. Synchronous areal observations were made using IZMIRAN-4 magnetovariation stations of the

Bobrov system. As a result of synchronous observations records were obtained at 17 field stations in a network of 100-200 km. The variations which were most expressive and which were registered at the greatest number of stations were processed. Maps of individual variations are examined in detail. The results presented in the paper illustrate the type of superior geophysical information which can be obtained when combining conductivity surveys with magnetovariation investigations.
[77]

V. UPPER ATMOSPHERE AND SPACE RESEARCH

News

TASS ANNOUNCES LAUNCHING OF "KOSMOS-963"

Moscow PRAVDA in Russian 26 Nov 77 p 3

[TASS Report: "'Kosmos-963'"]

[Abstract] The artificial earth satellite "Kosmos-963" was launched in the Soviet Union on 24 November 1977. The satellite was inserted into an orbit with the following parameters:
-- initial period, 109.3 minutes;
-- apogee, 1,220 kilometers;
-- perigee, 1,190 kilometers;
-- orbital inclination, 82.9 degrees.

"SALYUT-6" IN ORBIT FOR TWO MONTHS

Moscow IZVESTIYA in Russian 30 Nov 77 p 1

[TASS Report: "'Salyut-6': Two Months in Orbit"]

[Text] Flight Control Center. The scientific station "Salyut-6", which was inserted into a near-earth orbit on 29 September 1977, continues its flight. By 1500 hours Moscow time the station had completed 968 revolutions around the earth.

Since the trajectory correction conducted on 28 November the orbital parameters of the "Salyut-6" station have been:
-- apogee, 360 kilometers;
-- perigee, 345 kilometers;
-- period of revolution, 91.4 minutes;
-- orbital inclination, 51.6 degrees.

According to telemetry data, the on-board systems are functioning normally. The microclimate parameters in the modules are being maintained within the prescribed range. Incoming information from the "Salyut-6" station is being processed and studied. [5]

Abstracts of Scientific Articles

OPTICAL MODEL OF ATMOSPHERE USED IN THERMAL SOUNDING

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1009-1017

[Article by S. G. Denisov and O. M. Pokrovskiy, Leningrad State University, "Correction of Optical Model of the Atmosphere in Solving the Thermal Sounding Problem"]

[Abstract] The authors propose a statistical algorithm for routine correction of atmospheric transmission functions (in relation to solution of the thermal sounding problem) at each successive subsatellite point supplied with aerological information concerning the temperature field. On the basis of an interpretation of measurement data from the "Nimbus-5" satellite the article gives an analysis of the possibility of this approach in constructing latitudinal and seasonal optical models of the atmosphere. The authors then demonstrate the effectiveness of the adaptation algorithm in the exclusion of systematic error caused by the discrepancy between the used and real optical model of the atmosphere. The adaptation algorithm naturally enters into a computation model for the spatial analysis of the temperature field based on the simultaneous use of satellite and aerological information.
[98]

METHOD FOR MEASURING RADIANT HEAT FLUX IN THE ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 10, 1977 pp 1018-1024

[Article by A. A. Yeliseyev, Main Geophysical Observatory, "Optical-Acoustic Method for Direct Measurement of the Radiant Heat Influx in the Atmosphere"]

[Abstract] The article describes an optical-acoustic method for the direct measurement of the radiant heat flux in the atmosphere. The author has designed and fabricated an original instrument, which is described. A method is proposed for its calibration against a black body and a gas mixture

with a known integral absorption function. Laboratory investigations of the instrument were carried out, together with trial series of field measurements of the long-wave radiant heat influx in the surface layer for the cases of superadiabatic and inversion stratifications. The possibility of measurements in the short-wave region is indicated.
[98]

METHOD FOR DETERMINING ORIENTATION OF UNSTABILIZED ARTIFICIAL SATELLITES

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 690-707

[Article by V. V. Golubkov, "Analytical Method for Determining the Orientation of Unstabilized Slightly Perturbed Artificial Earth Satellites. II"]

[Abstract] This is the second part of Golubkov's study [for Part I see KOSMICH. ISSLED., 15, No 3, 376, 1977]. In this second part of the paper the motion of the center of mass of the satellite (its coordinates and velocity in an absolute geocentric coordinate system) was computed taking into account the influence of the gravitational forces of the earth, moon and sun and also the drag of the earth's atmosphere. Motion was determined by numerical integration of the corresponding differential equations. Information on orientation points was computed for the most commonly used types of measurements -- the readings of magnetometers and solar sensors. In an absolute geocentric coordinate system at the stipulated times the the direction cosines were computed for the direction from a stipulated point on the trajectory to the sun and the vector of strength of the earth's magnetic field was calculated. The author discusses the choice of the variables and the parameters to be determined. The article gives a detailed summary of the formulas making it possible, using an electronic computer, to calculate Euler-Poinsot motion, the functions to be measured and their partial derivatives on the basis of the mentioned parameters.
[82]

RADIATION TRANSFER IN VENUSIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 747-754

[Article by T. G. Adiks, A. P. Gal'tsev, V. M. Osipov and V. P. Shari, "Radiation Transfer in the Transparency 'Window' 2.86-4.16 μm in the Venusian Atmosphere"]

[Abstract] In earlier studies (A. P. Gal'tsev, et al., IZV. AN SSSR, FIZ. ATMOSF. I OKEANA, 7, No 8, 857, 1971; 9, No 10, 1097, 1973) the authors carried out quantum mechanical computations of the IR spectrum of CO_2 for the conditions prevailing in the atmosphere beneath the Venusian clouds.

Experimental data have now appeared which make possible a refinement of the earlier results and therefore an improvement of the results of computations of the fluxes of thermal radiation. Working with the transparency window 2.86-4.16μm and using new absorption coefficients for induced and weak IR and the isotopic bands of CO_2 falling in this window, it is shown that allowance for absorption in these bands leads to a decrease in the effective flux by approximately an order of magnitude. The results apply to a case of an atmosphere of pure CO_2; allowance for water vapor, whose presence has been confirmed by the measurements of "Venera-9" and "Venera-10," leads to lesser values of the effective fluxes in comparison with those obtained in this paper for pure CO_2.
[82]

OPTIMIZING PROCESS OF GRAVIMETRIC SURVEY ON LUNAR SURFACE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 792-796

[Article by V. A. Strel'tsov, "Optimizing the Process of a Gravimetric Survey on the Lunar Surface"]

[Abstract] At the present time one of the problems in investigating the moon is the direct measurement of gravity at its surface at different points using instruments carried aboard a lunar vehicle. The data obtained in this way are important for investigating the internal structure of the moon. Due to the rigorous restrictions on operation of the on-board equipment, it is important to avoid obtaining excess information. It is necessary to find the optimum distance between stations where gravity measurements are made. Since the gravimetric survey process is essentially an information process, its "product" is quantitative data on the observed field and it is natural to use as a criterion of its effectiveness an information criterion for determining the optimum distance between observation points. The information criterion for optimality of density of the network of gravimetric stations obtained in this study (formula (8)) makes it possible to take into account the statistical characteristics of the field of gravitational anomalies, that is, use available field data in order to avoid obtaining excess information in the survey. Comparison of the results obtained using formula (8) with the method for gravimetric surveying on the earth shows that this criterion corresponds well to the empirical requirements. The method can also be used on the surface of the Earth or Mars.
[82]

DEPENDENCE OF TEMPERATURE ON ALTITUDE FOR VENUSIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 796-798

[Article by L. V. Ksanfomaliti, "Model of Dependence of Temperature on Altitude for Interval 52-90 km in Venusian Atmosphere"]

[Abstract] On Venus the range of altitudes from the tropopause and the base of the stratosphere to the stratopause 60-90 km is very difficult for investigation. However, considerable information on this subject has been accumulated, but data published by different authors are difficult to reconcile. The author has sought to resolve this problem because an unambiguous T(z) dependence is required for the interpretation of radiometric and other experimental data. Figure 1 in the text gives a summary of data on the T(z) dependence. On the basis of these data a working model has been formulated and has been incorporated in Figure 1. It applies to the altitude range from 52 to 90 km. It reflects an averaging of all the experimental results and is close to theoretical models. The proposed model is easily represented in simple analytical form:

$$z = \frac{\Lambda}{T - \vartheta} + z_0 \qquad \text{or} \qquad T = \frac{\Lambda}{z - z_0} + \vartheta.$$

The constants Λ, ϑ and z_0 are found from three control points: 80 km and 200°K, 65 km and 250°K, 55 km and 305°K. These values correspond to $\Lambda = 1.025 \cdot 10^4$ km·degree, $\vartheta = 38°.46$ and $z_0 = 16.54$ km. The temperature gradient is

$$dT/dz = - \Lambda/(z - z_0)^2.$$

The dT/dz curve is shown in the same figure. The gradient increases to 4.36 degrees/km at 65 km and to 6 degrees/km at 57 km.
[82]

STUDY OF FIGURE OF PHYSICAL SURFACE OF PLANETS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 781-787

[Article by A. P. Tishchenko and L. I. Permitina, "Study of the Physical Surface of Planets from Space Photographs of Their Limbs (in the Example of Photographs Taken from the Spacecraft 'Mars-3')"]

[Abstract] The article describes an analytical method for processing measurements using space photographs of the limbs of planets for the purpose of studying the figure of the physical surface. An algorithm is proposed for determining the parameters of the ellipsoid of revolution approximating the geometric figure of the planet. This was used in processing measurements from photographs of the limbs of Mars obtained from aboard the "Mars-3" spacecraft. The results of the computations are given and discussed. The proposed method for studying the figure of the physical surface of a planet is general in character and can be used in the analytical processing of photographs of the limbs of any planets. Such data on the geometric figure of the planet can become an important supplement to other methods for its study, such as dynamic. The accuracy with which the desired parameters characterizing the geometrical figure of the planet are determined is dependent on the accuracy of trajectory data and a series of other factors.
[82]

DEVELOPMENT OF X-RADIATION EVENTS ON SUN

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 736-740

[Article by O. M. Kovrizhnykh, M. I. Kudryavtsev, A. S. Melioranskiy, I. A. Savenko, V. M. Shamolin and L. M. Chupova, "Development of X-Radiation Events on the Sun"]

[Abstract] A study was made of the complex group X-radiation events of 2 and 11 August 1972 and the microwave radio bursts corresponding to them. It is shown that these events can be related to the propagation of a disturbance along the solar radius which undergoes transition into a shock wave. Everything set forth in the paper gives basis for assuming that the acceleration of particles (appearance of hard x-radiation of high-energy electrons and the appearance of synchrotron radioemission caused by these same electrons) occurs in definite spatial regions at the time of formation of plasma turbulence there (generation of radioemission at a "plasma" frequency). These acceleration events sometimes have a group character and are caused by the stimulating effect of a disturbance propagating in the solar atmosphere. These same disturbances are evidently associated with the formation of shock waves (type-II bursts) and eruptive prominences. [82]

SATELLITE STABILIZATION BY USE OF DAMPING SPRING

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 683-689

[Article by V. A. Sarychev and V. I. Pen'kov, "Speed of Gravitational System for Satellites with a Damping Spring"]

[Abstract] The authors have investigated a system for the gravitational stabilization of a satellite with a damping spring. It is demonstrated that by using a damping spring allowing only translational movements with one degree of freedom it is possible to ensure asymptotic stability of the position of equilibrium of the satellite with respect to all angular variables. The article gives a determination of the optimum parameters ensuring the maximum rate of attenuation of the characteristic oscillations of the system. (It is shown that with a suitable choice of the moments of inertia of the satellite and the direction of the spring axis, in a linear approximation it is possible to relate satellite oscillations with respect to all angular variables to movements of mass and thereby ensure effective damping of all satellite oscillations.) [82]

SCATTERING OF ELECTROMAGNETIC WAVES BY TURBULENT FLOWS BEHIND SATELLITES

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 788-791

[Article by V. V. Valuyev and I. G. Yakushkin, "Scattering of Electromagnetic Waves by Turbulent Flows with a Transverse Shear Arising Behind Satellites During Flight in the Atmosphere"]

[Abstract] During the motion of space vehicles in the dense layers of the atmosphere turbulent flows with a transverse shear are formed behind them. In an earlier study (V. V. Valuyev, KOSMICH. ISSLED., 13, No 4, 539, 1975) it was shown that part of the trail can be supercritical and the Born approximation, used for computing the effective scattering cross section, is unsuitable. It was also postulated in this earlier study that the effective scattering cross section of the supercritical region is small and that it can be neglected. However, it was only possible to explain part of the experimental results. In this new paper the authors have computed the effective scattering cross section of turbulent flow of the subcritical and supercritical parts and approximate computations of the transient flow are presented. In contrast to the earlier study, an allowance is made for distortion of a pulsed signal during its scattering by an extended randomly inhomogeneous medium. As a result it was possible to interpret the available experimental data and carry out their quantitative comparison with theoretical computations. In carrying out the computations an allowance was made for the change in the distribution of N (electron concentration) in dependence on the configuration of the body and flight altitude, position of the region of transition from laminar to turbulent flow, and presence of a nonviscous flow region. The conclusion is drawn that in a general case allowance for a supercritical flow region is necessary since it can lead to an essentially different dependence of the scattered wave on the parameters of plasma and the conditions for carrying out the experiment.
[82]

AURORAL EFFECTS IN VARIATIONS OF ATMOSPHERIC ELECTRICITY POTENTIAL GRADIENT

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 17, No 5, 1977 pp 879-884

[Article by I. A. Zhulin, G. A. Zemlyankin, Kh. D. Kanonidi, V. A. Morgunov, N. K. Osipov, R. I. Turbin, Yu. V. Fedorenko, S. P. Chernysheva, D. N. Chetayev and V. M. Sheftel', Rostov Civil Engineering Institute, "Auroral Effects in Slow Variations and Short-Period Pulsations of the Atmospheric Electricity Potential Gradient of Magnetospheric Origin"]

[Abstract] The article describes the characteristics of slow variations and pulsations of the potential gradient of atmospheric electricity observed in the auroral region. The authors point out that in periods of good

weather there are interrelationships between these and other disturbances of an electromagnetic nature, developing in auroral regions during the time of magnetospheric disturbances. It was found that in the auroral region during periods of isolated substorms and world storms it is common to observe slow variations of the potential gradient of atmospheric electricity associated with magnetic disturbances and auroral luminosity. Variations of the potential gradient of atmospheric electricity in those cases when they are related to magnetospheric disturbances have a greater variability than magnetic variations and in most cases precede them. Slow variations of the potential gradient of atmospheric electricity are also related to variations of the electric field in the range of short-period pulsations.
[107]

EFFECT OF SEASONAL VARIATIONS OF NEUTRAL ATMOSPHERE ON E-LAYER IONIZATION

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 17, No 5, 1977 pp 839-846

[Article by G. S. Ivanov-Kholodnyy, L. N. Leshchenko, A. A. Nusinov and I. N. Odintsova, Institute of Applied Geophysics and Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Influence of Seasonal Variations of Neutral Atmosphere on Ionization of the Ionospheric E-Region"]

[Abstract] As a result of an analysis of data on ionospheric disturbances during the time of solar flares during different seasons it was possible to ascertain the relative contributions from ultraviolet and x- radiations from the sun and ionization of the ionospheric E region. The study is based on observational data on change in the critical frequencies of the E layer in the middle latitudes during 31 solar flares of different importance registered during 1968-1973. It was found that the seasonal variations of these parameters are caused by an increase in the concentration of molecular oxygen at the altitudes of the E region from winter to summer by a factor of 2-4.
[107]

METHOD FOR ANALYZING SOLAR FLARE PROTONS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 17, No 5, 1977 pp 820-825

[Article by T. M. Bezruchenkova, N. A. Mikryukova, N. K. Pereyaslova and S. G. Frolov, Institute of Applied Geophysics, "Diagnosis of Solar Flare Protons from Accompanying Electromagnetic Radiation"]

[Abstract] A study was made of the information content of the parameters characterizing the electromagnetic radiation of solar flares. The authors have derived a response function separating flares with the injection of

high-energy protons and flares without the injection of such protons. A regression equation is derived for prediction of the integral flux of protons with $E > 60$ MeV. It was found that the characteristics of x-radiation carry the most information for the diagnosis of high-energy solar cosmic rays among the considered parameters of solar electromagnetic radiation. These x-radiation characteristics are most informative during both the ascending and descending branches of the cycle. The error in predicting the integral fluxes of high-energy protons for a W group falls in the range of a factor of 1.2-1.5; for a W-E group it falls in the range of a factor of 2.5-3. The defined combinations of predictors make it possible to use this method for predicting radiation-dangerous phenomena in practical work even with an incomplete set of parameters without a significant lessening of the accuracy characteristics. Taking into account that the most informative predictors are the characteristics of x-radiation, it can be hoped that with the availability of monitoring data from artificial earth satellites in a geostationary orbit this method will prove to be the most operational.
[107]

PROPAGATION OF CHARGED PARTICLES GENERATED IN FLARE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 17, No 5, 1977 pp 811-819

[Article by Ye. I. Morozova, O. B. Likin and N. F. Pisarenko, Space Research Institute, "Propagation of Charged Particles Generated in Flare of 7 August 1972"]

[Abstract] The propagation of protons with $E_p \geqslant 15$ MeV from the flare of 7 August 1972 is described quite well by the diffusion of particles in interplanetary space with a diffusion coefficient in the form: $K(r) \sim r^{0.8} R^{0.17}$. It was possible to find the dependence of the diffusion coefficient on the hardness of the particles or distance. This dependence shows that during the considered period in the frequency region $f = 10^{-3}$-$5 \cdot 10^{-4}$ Hz the spectrum of the intensity of fluctuations of the interplanetary field is dependent on frequency and distance as $P \sim f^{1.83} r^{-4.5}$, that is, the relative amplitude of the fluctuations of the interplanetary magnetic field decreases with an increase in distance: $\Delta B/B \sim r^{-0.23}$. This dependence characterizes the attenuation of Alfvén waves as they propagate from the sun. The exponential spectrum of injection of protons ($dN/dR \approx 1.3 \cdot 10^{35} \exp(-R/R_0)$, $R_0 \approx 47$ MV), observed in the flare of 7 August 1972, makes it possible to postulate that the acceleration of particles is determined by electric fields. Such fields can arise due to the mechanism of magnetic field dissipation. An estimate of the fraction of energy ($\sim 7\%$) released in a flare in the form of high-energy particles ($E_p \geqslant 0.1$ MeV) is based on simultaneous measurements of charged particles and the parameters of the shock wave. This estimate can be adopted as an experimentally based value for most large flares.
[107]

INTEGRATION CONSTANTS FOR MOTION OF STATIONARY ARTIFICIAL SATELLITE

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA, No 13, MATEMATIKA-MEKHANIKA-ASTRONOMIYA in Russian No 3, 1977 pp 162-165

[Article by Ye. I. Timoshkova, Leningrad University, "Determination of Integration Constants in the Approximate Analytical Theory of Motion of a Stationary Artificial Earth Satellite"]

[Abstract] This article is a continuation of earlier work by the author (Ye. I. Timoshkova, "Approximate Analytical Theory of Motion of a Stationary Artificial Earth Satellite," TR. AO LGU, Vol 33, pp 77-85, 1977). In computations of satellite motion the formulated theory in a linear approximation makes it possible to take into account the acentrality of the earth's gravitational field, the gravitational attraction of the moon and sun. In this new paper the author examines the problem of determining the constants of the theory which must be found from the initial conditions. Usually the initial conditions of the problem are stipulated either in the form of the vectors of the initial position and velocity or in the form of two position vectors which are known for two stipulated moments in time. The paper is limited to a consideration of the first case of stipulation of initial conditions. Since the theory of satellite motion is formulated in spherical coordinates, it is assumed that six parameters are known

$$r(\tau),\ \varphi(\tau),\ \lambda(\tau),\ \dot{r}(\tau),\ \dot{\varphi}(\tau),\ \dot{\lambda}(\tau), \qquad (1)$$

where τ is a known time, r, φ, λ are the geocentric radius, latitude and longitude of the satellite. Using the stipulated values (1) it is possible to find the six constants. It is shown that if the vectors of initial position and velocity (1) are known, formulas (6), (11), (12) and (14) in the text will give the values of all the theory constants. Only after the constants have been computed does it become possible to predict satellite motion.
[97]

SHORT-PERIOD PULSATIONS OF PARTICLES IN UPPER ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA FIZICHESKAYA in Russian Vol 41, No 9, 1977 pp 1765-1771

[Article by A. M. Gal'per, V. M. Grachev, V. V. Dmitrenko, V. G. Kirillov-Ugryumov, A. V. Kurochkin, B. I. Luchkov, S. Ye. Ulin, E. M. Shermanzon and Yu. T. Yurkin, Moscow Physical Engineering Institute, "Observation of Short-Period Pulsations of Fluxes of Electrons and γ-Quanta in the Upper Layers of the Atmosphere and Their Relationship to Periodic Oscillations of the Solar Diameter"]

[Abstract] The authors made a search for periodic pulsations of cosmic rays in the upper layers of the atmosphere with periods from 10 to 60 minutes. The study was based on measurements carried out over a period of several years using instruments carried aloft by balloons. These instruments included both scintillation and Cerenkov detectors and multigap spark chambers ("Yelena" and "Anna-6" instruments, both of which are described). The purpose of the analysis was a search for periodic pulsations both in the total flux of charged particles and in individual components (electrons, γ-quanta). Although the results apply only to a few flights, they definitely indicate the existence of periodic pulsations of particle fluxes in the upper atmosphere. The pulsations are detected using different instruments, with different methods for registry and processing of data, and in different measurement years. The results still do not make it possible to ascertain what component of cosmic radiation incident on the boundary of the atmosphere is responsible for the periodic pulsations, but it is probably the electron component. [The paper is from the materials of the 8th International Seminar "Active Processes on the Sun and the Problem of Solar Neutrinos," Leningrad, 25-27 Sep 1976.] [83]

INTERPRETATION OF OPTICAL MEASUREMENTS ABOARD "VENERA-8"

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 15, No 5, 1977 pp 755-767

[Article by T. A. Germogenova, N. V. Konovalov, N. L. Lukashevich and Ye. M. Feygel'son, "Interpretation of Optical Measurements Aboard the 'Venera-8' Automatic Interplanetary Station"]

[Abstract] The illumination profile for the planet Venus was measured by instrumentation aboard the "Venera-8" automatic interplanetary station. The measurements were made in the wavelength range 0.40-0.80 μm with an effective wavelength 0.63 μm in the altitude range 0-48 km with a solar zenith angle 84.5±2°.5. In the article cited above the authors consider the problem of determining an optical model of the atmosphere and the albedo values for the planetary surface which would satisfy illumination data and data on planetary reflection (atmosphere-underlying surface system) in the same wavelength range. The problem is solved using asymptotic formulas for multilayer models of the atmosphere, making it possible to represent in analytical form the correlation between the medium and radiation. (The use of asymptotic formulas makes it possible to change from trial and error methods to solution of the inverse problem in determining the optical parameters of the atmosphere using illumination measurement data.) The following models are considered: model of a purely scattering atmosphere, two-layer model of the atmosphere with absorbing upper layer, three-layer model of the atmosphere with an absorbing mean layer. The authors determine the regions of change in the optical parameters of the selected models and surface albedo, taking the scatter of experimental data into account.
[82]

REVIEW OF EARTH'S PLASMOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 17, No 5, 1977 pp 784-803

[Article by K. I. Gringauz and V. V. Bezrukikh]

[Abstract] This review gives information on the earth's plasmosphere, emphasizing the results obtained during recent years using the "Prognoz" satellites. The presented information relates to the form of the plasmopause in the equatorial plane and to the distribution of ion temperature in the plasmosphere. However, using a single earth satellite or even several satellites simultaneously present in the magnetosphere it is impossible to obtain exhaustive information concerning the form of the plasmopause (since the satellites simultaneously intersect the plasmopause in the best case at a small number of points). Ground observations of atmospherics, despite their limitations (it is impossible to obtain data on the local concentration of charged particles outside the plane of the geomagnetic equator or obtain information on the temperature of particles, difficulties in obtaining daytime data), have played and continue to play an important role in investigations of the plasmosphere (especially the nighttime plasmosphere) since they make it possible to obtain statistically rich data with a good time resolution and by inexpensive means. In particular, it is worth noting the information on considerable inhomogeneities of the plasmosphere obtained by Carpenter and Park on the basis of data on whistlers. The daytime convexity of the plasmosphere under quiet geomagnetic conditions is a stable peculiarity of the plasmosphere and any new theory of formation of the plasmopause should also explain this peculiarity. As a result of investigations carried out on "Prognoz" satellites it is also possible to consider established that there is a cold ($T_i \lesssim 8000°$) and quite stable internal zone ($L \lesssim 3.5$) in the plasmosphere and a "hot" external zone, whose dimensions, form and T_i distribution vary greatly during magnetospheric storms and substorms. During prolonged magnetically quiet periods the plasma within the geomagnetic tubes of force of the outer zone is in diffuse equilibrium, which is impaired during periods of disturbances. [A wide range of matters relating to observational data and the physics of processes related to the plasmosphere and plasmopause is not covered in this review and the reader is directed to other reviews.]
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