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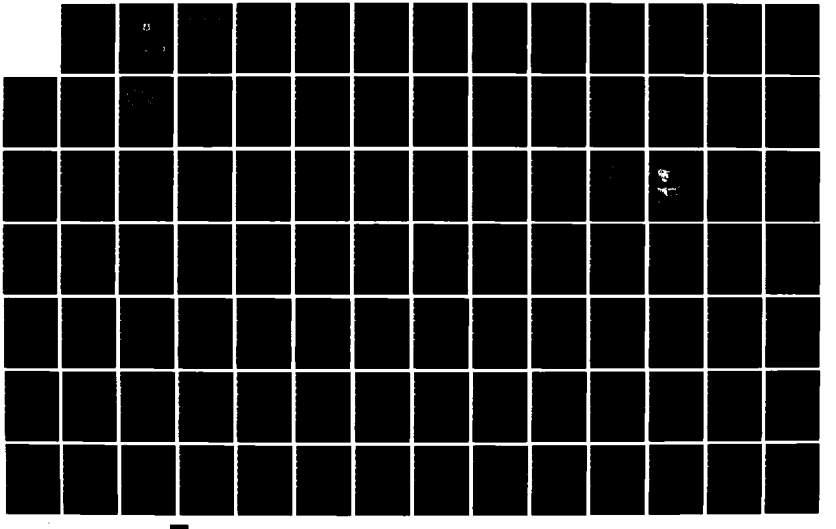

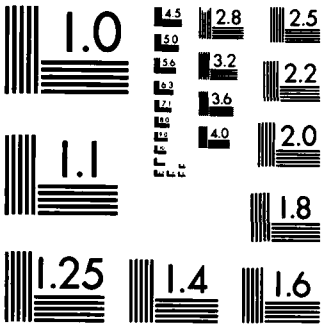

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CLIMATE AND MAN

(Selected Articles)

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RADIATION CHARACTERISTICS AND BASIC LAWS GOVERNING THE DISTRIBUTION OF WEATHER IN THE TERRITORY OF THE USSR.

Yu. N. Shvareva.

Structure of climate, expressed in weathers, is studied for many areas of USSR. This was reflected in the articles and the monographs (Fedorov, Baranov 1949; Fedorov, Chubukov 1950; Baibakov, etc., 1958, and a whole series of other works), in the cartographic publications (for example, the atlas of the agriculture of the USSR, 1960; the map/chart of the structures of climates of health resorts and therapeutic localities/terrains, 1962; the physicogeographical atlas of world, 1964), in the large medical encyclopedia (2nd edition), and also into the series "Natural conditions and the natural resources of the USSR". In these works basic laws governing the space-time distribution of weather in the territory of the USSR are shown with the aid of the tables of the frequency of the classes of weather, designed on the months of year, and the graphs/curves of the structures of a climate.

However, tabular and graphic material due to its unwieldiness is not always convenient for mapping; therefore we resorted to calculation of frequency of most important classes of weather as a whole in year. However, for refining the seasonal special features/peculiarities in the mode/conditions of the local weather during the many-year period such data are supplemented by the determination of the series/row of coefficients. For the purpose of the best comparability the coefficients are designed for the conventional seasons of year.

As their basis frequency of classes of weather, by which most important properties of weather mode/conditions are characterized is assumed. It is natural that it is expedient to select coefficients for each season on their practical significance. The value of coefficients is expressed by the ratio of a number of days (n) with the weather of one or the other class (or the group of classes) to a total number of days (N) in the season and, therefore, it can vary from 0 to 1. Classes are grouped as follows: the coefficient of atmospheric aridity (I+II); severe atmospheric aridity (I); cloudiness (VI+VII); night frigidity (ALL VIII + IX + frost); 24-hour frigidity (all frost); severe frigidity (XIII+XIV+XV).

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Most general laws governing space-time distribution of all classes of local weather are given in Tables 1 and 2 by basic natural climatic zones and Soviet Union areas.

For development/detection of connections/communications of radiation characteristics (sunshine, total, straight/direct and diffuse radiation to horizontal surface) with each class of local weather we used data of actual observations of components of radiation conditions on stations, located in different zones of Soviet Union: by Tartu - 58° N, Moscow - 56° N, Kiev - 50° N (forest of temperate zone); Odessa - 46° N (Black Sea steppe); Tashkent - 41° N (oasis in desert steppe); Alma Ata - 43° N (foothills Zailiyskiy Alatau).

Table 1. Frequency of the classes of weather in the basic topographical zones and in the natural areas of the Soviet Union (in the year), %.

(1) Природные зоны и районы	(2) Станции	(3) Классы погод							
		I – II	III+V	IV	VI+VII	XVI	VIII–IX	X+XI+XII	XIII+XIV+XV
4 Арктическая пустыня	5 Бухта Тихая	—	2	1	4	—	22	57	14
6 Тундра	7 Мурманск	1	14	8	21	—	20	35	1
	8 Бухта Тикси	0	9	4	11	—	12	30	34
9 Лесотундра	10 Салехард	0	15	7	12	—	15	35	16
	11 Верхоянск	2	13	6	7	—	15	16	41
12 Тайга	13 Сургут	1	16	10	13	—	15	31	14
	14 Якутск	7	15	7	6	—	15	15	35
15 Смешанные леса	16 Рига	1	28	13	21	—	22	15	0
	17 Енисейск	2	23	9	12	—	14	29	11
18 Широколиственные леса и лесостепь	19 Киев	7	25	16	15	—	20	17	0
	20 Омск	7	17	14	10	—	14	29	9
21 Муссонный тип климата	22 Владивосток	1	34	6	16	2	14	26	1
23 Степь	24 Луганск	16	17	15	14	—	18	20	0
	25 Павлодар	12	18	13	6	—	14	28	
26 Полупустыня	27 Кзыл-Орда	36	16	4	5	—	20	19	0
28 Пустыня	29 Репетек	53	20	4	4	—	17	2	—
30 Средиземноморский тип климата	31 Ялта	14	45	16	16	0	8	1	—
32 Умеренно влажные субтропики	33 Лейкорань	6	49	9	26	2	7	1	—
34 Влажные субтропики	35 Сухуми	2	61	10	18	5	4	0	—

The note: I - sunny very hot and very dry weather (arid-arid); II - solar hot and dry (moderately arid); III - light cloud moderately humid; IV - cloud in the daytime and low cloudy night; V. Sunny moderatly humid with cloudy weather during the night; VI - cloudy without precipitation; VII - rainy; XVI - humid tropical; VIII - weather with the transition of temperature through 0°, cloud in the daytime; IX - also, solar in the daytime; X - weakly frost weathers; XI - moderately, XII - is considerable, XIII - strongly, XIV - severely/cruelly, XV - extremely frost weathers.

Key: (1). Natural zones and areas. (2). Stations. (3). Classes of weathers. (4). Arctic desert. (5). Bay, calm. (6). Tundra. (7). Murmansk. (8). Tiksi bay. (9). Forest-tundra transition area. (10). Salekhard. (11). Verkhoyansk. (12). Taiga. (13). Surgut. (14). Yakutsk. (15). Mixed forests. (16). Riga. (17). Yenisey. (18, Broad-leaved forest and wooded plain. (19). Kiev. (20). Omsk. (21). Monsoon type of climate. (22). Vladivostok. (23). Steppe. (24). Lugansk. (25). Pavlodar. (26). Semidesert. (27). Kzyl-Orda. (28). Desert. (29). Repetek. (30). Mediterranean type of climate. (31). Yalta. (32). Moderately humid subtropics. (33). Lenkoran'. (34). Humid subtropics. (35). Sukhumi.

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The radiation characteristics of the most important classes of the local weather on st. Omsk - 55° N (wooded plain) - to us were kindly furnished by A. D. Sharygin (1967).

Structure of climate of all stations indicated, expressed in weathers, was previously published in press/printing (Chubukov, Shvareva, 1964; Baybakova, etc., 1962; Rayk, 1964).

Calculations of such radiation characteristics were made within entire period of summers/years for each station. Therefore,

naturally, it proved to be somewhat different (on Tartu - 1950-1958; Moscow - 1957-1965; to Omsk - 1958-1963; to Kiev - 1953-1958; to Odessa - 1949-1959; to Alma Ata - 1945-1960; to Tashkent - 1945-1957).

Table 2. Frequency of the classes of weather in the mountain areas of the Soviet Union (in the year), %.

1 Районы	2 Станция	3 Высота станций, м	4 Классы погод I+II	III+V	IV	VI+VII	VIII+IX	X+XI+XII	XIII+XIV+XV
5 Памир	6 Л-к Федченко	4 200	—	7	1	1	30	60	1
	7 Мургаб	3 600	6	12	8	3	39	29	3
	8 Душанбе	800	31	36	7	9	16	1	—
9 Копетдаг	10 Хейрабад	2 000	22	31	5	6	22	14	—
	(10a) Гаудан	1 500	35	29	8	6	19	3	—
11 Заилийский Алатау	12 Мын-Джилки	3 000	0	14	10	6	34	36	0
	13 В. Горельник	2 200	3	27	11	8	30	21	0
	14 Усть-Горельник	1 800	2	29	12	10	28	19	0
	15 Медео	1 500	9	31	12	9	26	13	—
	16 Алма-Ата	900	22	25	7	8	21	17	0
17 Северный склон	18 Казбеги	3 700	—	5	6	4	27	57	1
19 Большого Кавказа	20 Теберда	1 300	2	28	11	16	37	6	—
	21 Кисловодск	900	5	30	14	17	24	10	—
22 Южный склон	23 Гудаури	2 200	0	17	14	20	27	22	0
24 Большого Кавказа	25 Пасанаури	1 100	2	36	8	20	27	7	—
26 Малый Кавказ	27 Бахмаро	1 900	2	24	10	19	30	15	—
28 Большой Кавказ	29 Местиа	1 500	1	30	6	16	38	9	—
30 Армянское плато	31 Арагац	3 200	1	14	11	5	23	46	0
	32 Севан	1 900	2	32	10	10	21	25	—
	33 Ленинакан	1 500	7	27	11	10	27	18	0
	34 Ереван	900	28	29	5	9	21	8	—
35 Алтай	36 Кош-Агач	1 600	2	16	7	6	25	19	25
	37 Аршан	900	1	22	7	9	22	32	7
38 Полярный Урал	39 Ра-Из	900	0	9	4	8	15	56	8

Key: (1). Areas. (2). Stations. (3). Height/altitude of stations, m. (4). Classes of weathers. (5). Pamir. (6). L-k Fedchenko. (7). Murgab. (8). Dushanbe. (9). Kopet Dagh. (10). Kheyrabad. (10a). Gaudan. (11). Zailiyskiy Alatau. (12). Myn-Dzhilki. (13). V. Gorel'nik. (14). Ust'-Gorel'nik. (15). Medeo. (16). Alma Ata. (17). Northern slope. (18). Kazbegi. (19). Large Caucasus. (20). Teberda. (21). Kislovodsk. (22). Southern slope. (23). Gudauri. (24). Large Caucasus. (25). Pansanauri. (26). Small Caucasus. (27). Bakhmaro. (28). Large Caucasus. (29). Mestia. (30). Armenian plateau. (31).

Aragats. (32). Sevang. (33). Leninakan. (34). Yerevan. (35). Altai. (36). Kosh-Agach. (37). Arshan. (38). Polar Urals. (39). Ra-Iz.

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After average daily and monthly values of radiation characteristics for each class of frostless weathers were calculated, latter were united on more prolonged periods: from May through August for all stations, except Alma Ata and Tashkent. At two latter/last stations this period, naturally, proved to be somewhat longer - from April through September. For the weathers with the transition of the temperature of air through 0° and frost such calculations were made for entire period of their possible emergence (cold season).

As is known, utilized classification of local weather has morphological basis in essence. It encompasses 16 classes, which enter into three basic groups of the weathers: frostless (8 classes), weather with the transition of the temperature of air through 0° (2 classes) and frost (6 classes).

Let us give basics idea about laws governing of formation/education and distribution of classes of weathers and their radiation characteristics.

by thunderstorms. In the second case the formation/education of cloudiness is connected with the frontal processes. In this case most frequently drop out the precipitation. In the plain of the USSR this weather is especially typical for the warm period in the forest-steppe and forest zones.

Formation/education of weather type in question favors thermal heterogeneity of underlying surface (for example, alternation of forests and field land, swamps/marshes and dry-valley sections, increased ruggedness of relief).

In weathers of IV class without precipitation most frequently do not appear negative reactions in man. When cloudiness is not continuous, possible to carry out climato-therapeutic procedures in air. EET are in the daytime located usually in comfort zone. In the same cases, when it is in the daytime predominantly cloud, precipitation on top of that drop out, man can test/undergo fresh heat-sensations. Conducting climato-therapeutic procedures in these conditions is hindered/hampered, jaunts should be limited.

Table 4. Radiation characteristics of sunny moderately humid and humid weather, solar moderately humid and humid with cloudiness at night.

(1) Широта, °	(2) Число часов солнечного сияния		(3) Радиация, ккал/см² сут					
			(4) суммарная		(5) прямая		(6) рассеянная	
	а	б	а	б	а	б	а	б
58	11	9	510	480	310	250	200	230
56	12	10	560	500	350	280	210	210
55	12	9	540	460	350	240	190	220
50	11	8	540	510	330	270	210	240
46	11	9	580	530	400	320	180	210
43	10	8	520	460	360	290	160	170
41	10	8	500	440	380	300	120	140

Note: a) sunny moderately humid and humid weather; b) sunny moderately humid and humid weather with the cloudiness at night.

Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation, gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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Weather with daytime cloudiness can appear as a result of two different processes - with heating of uniform air mass or with passage of front. In the first case the formation/education of convective cloudiness does not always lead to the precipitation (fair-weather cumulus). But if convection is very intense, then precipitation can drop out in the form of showers and be accompanied

characteristics make it possible to judge also conditions of illumination, whose values by us were also examined. In these weathers of illumination condition [1] are best.

Representation about total radiation gives possibility to calculate quantity of biodoses, utilized with heliotherapy (for period, when solar altitude it exceeds 30°). They proceed from the relationship/ratio, that 1 biodose is equal to 20 gcal/cm² (Boksha, 1966).

Weather cloud in the daytime and light cloud at night (IV class) with precipitation or without precipitation is characterized by smaller number of days of sunshine (5-10). The average daytime values of total radiation in this weather are 320-480 gcal/cm² day, straight line - 150-250 and scattered - 150-230 gcal/cm² day (Table 5).

Both weathers of II, III and V classes and weathers with daytime cloudiness in desert zone also more frequently appear in spring and in autumn, why here and are observed somewhat smaller values of total and direct radiation.

FOOTNOTE [1]. See T. P. Aleshina's article. ENDFOOTNOTE.

autumn. North of steppe it is observed during entire the warm period.

Sunny moderately humid and humid weather with cloudiness at night (V class) with precipitation or without precipitation is caused by cyclonic activity, which becomes apparent in this or another area in night time.

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It is characteristic for the seaside areas of the moderate and south latitudes of the Soviet Union; in the latter it can appear, also, during the air-mass process as a result of humidity of air mass above the sea in the night time. The number of days of sunshine reaches 8-10; total radiation - 440-530 gcal/cm² day; straight line - 240-320; scattered - 140-240 gcal/cm² day.

Weathers of III and V classes are most favorable in climato-therapeutic sense. With them comfortable heat-sensations usually in the daytime are observed. Precipitation in the weather with the cloudiness at night refreshes air and improves the conditions of climatotherapy in the daytime.

In conclusion about sunny frostless weathers (i.e. I, II, III and V classes) it should be noted that their radiation

trees/wood and above-water aerosolariums.

Sunny moderately humid and humid (light cloud) weather (III class) is characterized by from solar hot and dry (II class) mainly higher relative humidity (60-80%) and by more moderate temperatures. The weather in question is characterized by the somewhat smaller number of days of sunshine, total and direct radiation. This is connected with the fact that the sun is in the daytime partially closed with cloudiness, and also with the high values of relative humidity. The relation of radiation characteristics with the relative humidity is reverse/inverse: the higher the relative humidity, the less the number of days of sunshine, and total and direct radiation (Table 4) is also less.

This weather appears also under conditions of radiation heating of air mass, which takes place with even lower values of arriving radiation, and when stratification of lower layers of atmosphere does not favor transfer of water vapor into layers, situated higher than condensation level. This weather is sufficiently characteristic with the anticyclones, which appear in the southern arid regions (desert and desert steppes) in the period of early spring and late autumn. Specifically, by this fact are explained the observed here smaller values of total radiation. In the steppes this weather more frequently occurs in second half of spring and in first half of

and forest-steppe bands of the Urals (St. Ivdel', upper Dubrava and Omsk) decrease to the north.

FOOTNOTE [1]. They are carried out based on materials of the climatological expedition of the institute of the geography of the AS USSR by N. A. Ostroumova and Yu. N. Shvareva (1963) for the Khorezm oasis and Ye. M. Baybakova et al. (1963) for Tbilisi. ENDFOOTNOTE.

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Origin of moderately arid weather is also connected with well expressed process of radiation heating of air mass. However, it flows/occurs/lasts under the conditions of the lower energy characteristics of the arriving radiation. Especially good this is expressed in the desert and in the desert steppe, where this weather more frequently is observed at the end of the spring and in the beginning of autumn. In connection with this here (latitude 41 and 43°) this weather is characterized by the somewhat smaller values of total radiation in comparison with the more northern areas, where the maximum of its frequency falls to the summer.

In this weather, as in weather of I class, climato-therapeutic procedures most frequently can be carried out only in early morning hours. More lately also should be utilized a wind effect, a shadow of

foot-wear.

Many special features/peculiarities of physiology of man (heat-sensation, water-salt exchange, etc.) under conditions of hot and dry climate are obliged in essence to effect of this weather. It is clearly favorable for the kidney patients, in connection with which in Bayram-Ali first-class health resort along this profile of disease acts.

Hot and dry (moderately arid) weather (II class) is observed to more north latitudes than weather of I class (see Fig. 1). Total radiation is within the limits of 540-620 gcal/cm² day, straight line - usually 380-460, scattered - 120-220 gcal/cm² day.

Number of days of sunshine composes 10-14 (Table 3). With the greatest number of days of sunshine, and also by the greatest values of other radiation characteristics in this weather under the conditions of plains territory are characterized more north latitudes, where the summer day is substantially longer. During the comparison of plains and foothill stations due to the special features/peculiarities of their location other laws can be observed. Thus, A. D. Sharygin in his article (1967) asserts that the radiation characteristics (direct radiation to the horizontal surface and the number of days of sunshine) with all classes of weather in the forest

variations, to which on the whole the human organism is well managed. There is the foundation for asserting that in this weather the ionization of air is most considerable. Thus, in Belokurikh (Altai) a number of light positive and negative ions in sunny very hot and very dry weather composes 2721 against 2020 with the rainy (Kudryavtseva, 1963).

However, in weather of I class only due to high temperatures in midday time are created heat-sensations uncomfortable for man, when danger of overheating organism is sufficiently large. Actually/really, the calculations[1] of equivalent-effective temperatures showed that the most favorable conditions of heat-sensation for the man in this weather are noted in the morning hours (approximately to 10 hours). In the daytime begins the large danger in hyperthermy and in the hyper-insolation of organism. At this time it is necessary to utilize a wind effect and to carry out solar and air baths out of the enclosures, in the shadow of trees/wood, on above-water aerosolariums.

In this weather appears need for isolation of living quarters from heat of solar rays/beams and thoroughly heated surrounding air, in use of installations on conditioning and of other means, which improve microclimate of locations, in carrying of light and refreshing clothing (for example, from flaxen fabric) and lightened

the distribution of arid-arid weather along two high-altitude profiles, one of which is arranged/located on the northern slope of the main Caucasian ridge/spine, which adjoins the steppe zone (Nagaytsev, 1963), another - on the northern slope of Zailiyskiy Alatau, which is located under the effect of the desert (Chubukov, Shvareva, 1962). Both profiles are arranged/located by approximately one and the same latitude, with the location of ridges/spines close to the latitudinal. On the northern slope of main Caucasian ridge/spine arid-arid weather is noted to the heights/altitudes of 1000-1300 m, while on the northern slope of Zailiyskiy Alatau - to 2000 m.

Radiation (including light) mode/conditions in this weather is characterized by great ones, as we already spoke, with average/mean values of daily quantities of total solar radiation (560-630 gcal/cm² day against 260-330 gcal/cm² days with rainy). This leads to the bright visual impressions from the topographical factors, which is very valuable from a psychotherapeutic point of view, allows/assumes the wide use of heliotherapy.

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Furthermore, under the conditions of this weather the most important weather constituents of a climate test/undergo only correct daily

radiation, spent on the evaporation, somehow: the large/coarse and well irrigated oases, some foothill (or low-mountain) areas, littoral and Caspian Region island, coastal areas of Aral sea and delta of Volga. As an example of this can serve the data about the frequency of arid-arid weather during July, given in the work of L. A. Chubukov (1969) for the stations, arranged/located along the line: Kura-Araksin lowland - Caspian Region - desert and Central Asia oases.

Tendency of reduction in frequency and intensity of this weather toward north (to wooded plain) becomes apparent very distinctly, which is evident from map/chart of its frequency during July, given in work of Ya. I. Feldman and L. A. Chubukov (1955), and from other published works. In this case, naturally, is shortened the period of its possible formation/education, which is well noticeable on the maps/charts of the structures of a climate in the weathers.

Similar phenomenon is observed also with change in altitude of locality/terrain in southern mountain areas, where cases of inversion distribution upon transfer from northern slopes to vast plateau are not nevertheless excluded. However, in the Caucasus arid-arid weather appears considerably less frequent and is outlined at the lower altitudes, than in the mountains of desert zone. This law can be illustrated, after examining the special features/peculiarities of

Table 3. Radiation characteristics of sunny very hot and very dry weather, by solar hot and dry.

(1) Широта, °	(2) Число часов солнечного сияния		(3) Радиация, ккал/см² сут					
			(4) суммарная		(5) прямая		(6) рассеянная	
	а	б	а	б	а	б	а	б
58	—	14	—	610	—	390	—	220
56	14	14	620	620	430	420	190	200
55	—	14	—	620	—	440	—	180
50	12	12	580	600	400	400	180	200
46	12	12	590	600	430	440	160	160
43	11	10	560	540	380	380	180	160
41	12	11	630	580	520	460	110	120

Note: a) sunny very hot and very dry weather; b) sunny hot and dry weather. (1). Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation, gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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Sunny very hot and very dry weather is typical for the summer in the desert zone, where the relationship/ratio of heat and moisture is characterized by the high expenditures of thermal energy for turbulent heat exchange between the underlying surface and the atmosphere and where, therefore, the process of the radiation heating of air masses is expressed vividly (Repetek). Frequency and intensity of this weather within the limits of desert and semiarid zone everywhere decreases, where increases the portion of the residual

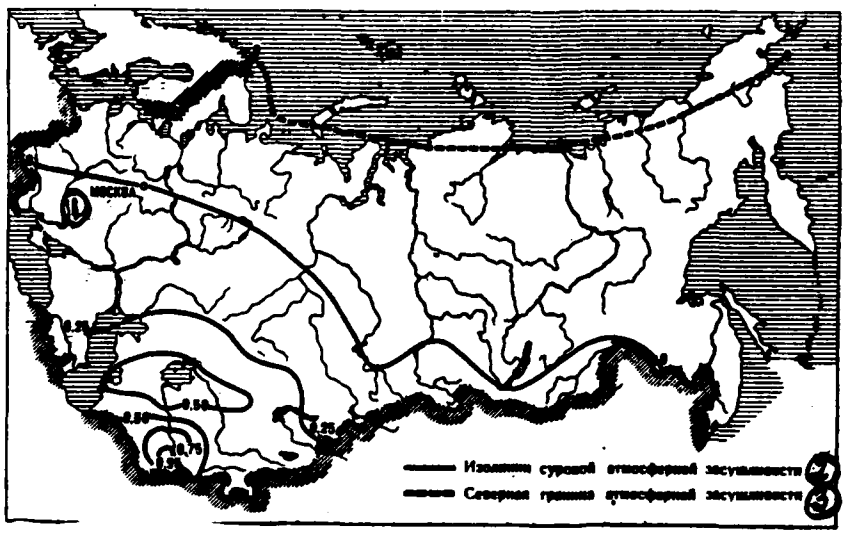

Fig. 1. Schematic map/chart of the distribution of severe atmospheric aridity and the northern boundary of atmospheric aridity.

Key: (1). Moscow. (2). Isolines of severe atmospheric aridity. (3). Northern boundary of atmospheric aridity.

Values of total radiation in sunny very hot and very dry weather little change with latitude. To a considerable degree this is connected with the fact that this weather almost everywhere appears in the middle of the summer, when differences in amounts of solar radiation in the latitude are small. However, the average/mean daytime sums of direct radiation show the larger difference (somewhat increasing to the south).

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Of laws governing the geographical distribution of diffuse radiation others: it clearly increases from the south to the north. The latter is explained by lower midday altitude of sun in the northern areas, which leads to the larger scattering power of atmosphere.

Frostless weathers.

Sunny very hot and very dry (arid-arid) weather (I class) most frequently appears in southern part of USSR (Fig. 1) in summer months under conditions of clear or light cloud sky and it is characterized by good illumination. In this weather, as developments showed, the greatest daytime number of days of sunshine (in average/mean 11-14) in comparison with other weathers is observed. However, the average/mean values of the daytime values of the arriving radiation - total (straight/direct + scattered) - in this weather are close to the values in sunny hot and dry weather (Table 3).

With radiation characteristics of classes of weathers average values were utilized in essence. The analysis of all characteristics showed that most frequently their values were close to the average values. This is confirmed by the calculations of the coefficient of variation for the data according to total radiation in Moscow. The latter, naturally, proved to be smallest for the weathers with a sunny day. Its values for the average monthly values do not usually exceed 10%, while in the cloudy weathers it reaches 20% and somewhat more. However, extreme values are not characteristic. They in many respects are caused by the specific character of the work of heliograph, and also by the complexity of observations of the cloudiness.

Table 5. Radiation characteristics of the weather of cloud by day and by light cloud night.

1 Широта, °	2 Число часов солнечного сияния	3 Радиация, ккал/см² сут		
		4 суммарная	5 прямая	6 рассеянная
58	7	380	150	230
56	10	480	250	230
55	9	440	230	210
50	8	450	220	230
46	8	430	210	220
43	5	340	160	180
41	5	320	170	150

The note: on latitude of 55° (Omsk), according to the data of A. D. Sharygin, daytime radiation amounts with the V and IV classes are amazingly close to each other. We consider that this exception/elimination.

Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation, gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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Cloudy weather without rain (VI class) is usually connected with passage of low-activity fronts or with formation/education of inversion cloudiness in anticyclones. Radiation characteristics in the cloudy weather have even smaller values, than in the weather with the daytime cloudiness. Thus, the number of days of sunshine composes 4-8; the average daytime values of total radiation - 290-440 gcal/cm²

day, straight line - 100-210, scattered - 160-240 gcal/cm² day (Table 6).

This weather in forest and steppe zones is observed by autumn and in spring, less frequently in summer, in zone of desert - usually during cold half-year.

Rainy weather (VII class) corresponds to situation, when during larger part of days considerable lower cloudiness is held and precipitation drop out. Most frequently this weather has frontal origin. Therefore it frequently appears in the warm season in the north, the west and the east of the country; in the south - only, where to this they favor the special feature/peculiarity of atmosphere circulation in combination with the specific character of physicogeographical device/equipment (mountain, sea) as, for example, in the area of humid and moderately humid subtropics (Kolkhid and Lenkoran' lowlands), and especially into cold half of year. Radiation and light mode/conditions with it is even more low. The number of days of sunshine - 3-5; total radiation reaches 260-330 gcal/cm² day, straight line - 70-120, scattered - 140-210 gcal/cm² day.

Weather effect of VI and VII classes on man from hygienic and health resort point of view is most frequently unfavorable. Such weathers in the high degree limit the possibilities of climatotherapy. Being characterized moreover, by the lowered/reduced illumination, they frequently cause the oppressive mood in patients.

Table 6. Radiation characteristics of cloudy without the precipitation weather and rainy.

(1) Широта, °	(2) Число часов солнечного сияния		(3) Радиация, ккал/см²сут					
			(4) суммарная		(5) прямая *		(6) рассеянная	
	а	б	а	б	а	б	а	б
58	7	5	350	270	110	70	240	200
56	8	5	440	310	210	110	230	200
55	7	4	370	290	160	90	210	200
50	6	5	390	310	150	100	240	210
46	6	4	400	330	170	120	230	210
43	4	3	290	280	100	100	190	180
41	6	4	300	260	140	120	160	140

Note: a) cloudy without the precipitation weather; b) rainy weather.

Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation, gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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Organized climatotherapy (in particular, jaunt) in the rainy weather is impossible.

Very hot and very humid (humid-tropic) weather (XVI class) is typical for summer season in areas of humid (Kolkhida) and moderately humid (Lenkoran' lowland) subtropics, and also for monsoon climate of south of Primorskiy Kray. Extremely rarely it is observed in the areas with Mediterranean type of climate - on the southern shore of

Crimea and on the north of the Black Sea coast of Caucasus (in the section of Tuapse-Anapa).

In this weather at high temperatures and relative humidity EET also have maximum values. The almost complete absence of the wind contributes to this. In humid-tropic weathers comfort zone usually has the greatest frequency only in the early morning hours (up to 7-8 hours of the morning) and sufficiently late in the evening and at night (later than 19 hours). In the remaining time predominates the state of the thermal overheating of organism, even in the shadow. Due to the high values of the relative humidity of men during only day, and it sometimes at night perceives heat[1]. Those arrived from the north especially with difficulty transfer this weather.

Weather with the transition of temperature through 0°.

Weathers with transition of temperature through 0° are subdivided into cloud in the daytime (VIII class) and solar in the daytime (IX class). With the VIII class the insolation duration is small - 1-2 hours in a 24 hour period, with the IX class considerable - 6-9 hours (Table 7).

Average/mean daytime values of total radiation with solar bottom are approximately/exemplarily 2-3 times more than with cloud.

Differences in the values of direct radiation are essential. All radiation characteristics of these weathers in essence prove to be on different latitudes approximately identical. This law somewhat is disrupted on latitudes of 55-56°. The latter is connected with the fact that these weathers here appear mainly in spring and in autumn. On other more south latitudes they are frequent and in winter.

In winter, and it is more frequent by early spring and by late autumn, appearance of weather with transition of temperature of air through 0° against general/common/total background of minus temperature causes thaws. It is typical for the plains areas of middle latitudes in the transition periods, and for srednegor'ye of the south it is characteristic in winter (for example, Teberda, Abastumani).

FOOTNOTE [1]. The cases of humid-tropic weather can be associated with the concept of "stuffy weather" (Akimovich, Ballala, 1970). ENDFOOTNOTE.

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This weather, clear in the daytime, with static atmosphere is favorable for climatotherapy (aerotherapy and heliotherapy on verandahs, jaunt). With the wind the use/application of the

correcting devices/equipment, which remove/take the cooling effect, is necessary. The weather, cloud in the daytime (usually having frontal origin), are caused in man unfavorable reactions, especially into the autumnal time. This is connected with the poor illumination and the precipitation, frequently drizzling character. To carry out climatherapy with it is frequently impossible.

Frost weathers.

Frost weathers unite X, XI, XII, XIII, XIV and XV classes. The use of the temperature and wind as the basic classification signs/criteria of frost weather is caused by the fact that in the cold period of year these signs/criteria have the greatest bioclimatic value. As is known, at low temperatures the wind strongly worsens/impairs the thermal sensation of man.

Frost weathers are formed/shaped under conditions of negative radiation balance. Average insolation duration with all classes of frost weathers with the solar bottom composes 4-7 hours, with the cloud bottom - 0-2 hours. The average values of total radiation in the weather with a sunny day are approximately 2 times more than with the cloud bottom, direct radiation - in 5 or more times. In the distribution of total and direct radiation the tendency of an increase from the north to the south is noticeable also. The average/mean daytime values of diffuse radiation have the small difference (Table 8).

Table 7. Radiation characteristics of weather with the transition of the temperature of air through 0°.

(1) Широта, °	(2) Число часов солнечного сияния		(3) Радиация ккал/см²сут					
			(4) суммарная		(5) прямая		(6) рассеянная	
	а	б	а	б	а	б	а	б
58	2	6	100	260	20	150	80	110
56	1	9	100	320	30	210	70	110
55	2	8	160	350	40	220	120	130
50	1	6	100	230	20	130	80	100
46	1	6	90	230	30	130	60	100
43	1	6	130	240	30	140	100	100
41	1	6	100	230	20	150	80	80

Note: a) cloud in the daytime; b) solar in the daytime.

Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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As showed our more detailed developments, as a rule, weathers of increased frigidity are characterized by somewhat larger values of arriving radiation in limits of area being investigated.

Weakly and moderately frost weathers with sunny day with calm are favorable for conducting of strolls, occupations by winter forms of sport and even for climatotherapy on verandahs. Considerably frost weather under the same conditions of the cloudiness and wind (clear

day and calm) is less favorable. With it the jaunts are realized to close distances, climatotherapy - only in the special locations. The weathers of the increased frigidity (strongly, severely/cruelly and extremely frost), which frequently appear in the continental areas of the Asian territory of the Soviet Union (Fig. 2), impede stay in air, jaunts, occupations by sport, and if they moreover, are accompanied by the wind, then stay in air becomes impossible. The weathers of the increased frigidity present special requirements for the clothing, foot-wear, to the temperature conditions of dwellings (Vadkovskaya, etc., 1960).

All examined by us classes of weathers in connection with man, according to Azhitskiy (1966), it is possible to divide into groups: favorable ones (II, III, IV, V, IX, X, XI classes), relatively favorable ones (VI, I, VIII, XII, XVI classes) and unfavorable (VII, XIII, XIV, XV classes and all cases of weather with high wind, fog and thunderstorm).

Favorable group of weathers is transferred well by all people (healthy and by patients).

Table 8. Radiation characteristics of all frost weathers.

(1) Широта, °	(2) Число часов солнечного сияния		(3) Радиация, ккал/см² сут					
			(4) суммарная		(5) прямая		(6) рассеянная	
	а	б	а	б	а	б	а	б
58	5	1	140	60	70	10	70	50
56	5	1	160	70	80	10	80	60
55	4	1	130	90	60	10	70	80
50	5	1	180	80	80	10	100	70
46	7	2	190	100	90	20	100	80
43	5	0	200	120	100	20	100	100
41	5	1	190	110	100	10	90	100

Note: a) solar in the daytime; b) cloud in the daytime.

Key: (1). Latitude. (2). Number of days of sunshine. (3). Radiation, gcal/cm² day. (4). total. (5). straight line. (6). scattered.

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The relatively favorable group of weathers is transferred by healthy people satisfactorily, and in patients negative meteoropathic reactions can appear. The unfavorable group of weathers is transferred by healthy people differently, but in essence it is satisfactory. In patients besides meteoropathic reactions there can be the aggravations of diseases.

However, taking into account results of analysis of weather effect on organism of human of other researchers, to us seems more

regular somewhat different subdivision of weather. Namely, leaving the group of favorable weather without the change, one should relate to relatively the only the VI and XII classes of weathers, whereas classes I, VIII and XVI must be related to the group of unfavorable weathers. This question requires further refinement.

Contrast variability of weather.

In recent years considerable attention was given to explanation of physiologo-stalemate-therapeutic value of classes of weather (Ovcharova, 1963; Nevrayev, Chubukov, 1963; Yurazh, 1961, etc.). This made it possible to approach the substantiation of the new characteristic of climatological mode/conditions - the contrast variability of weather.

For evaluating contrast variability of weather was proposed working diagram of her determination (Baibakova, etc., 1964).

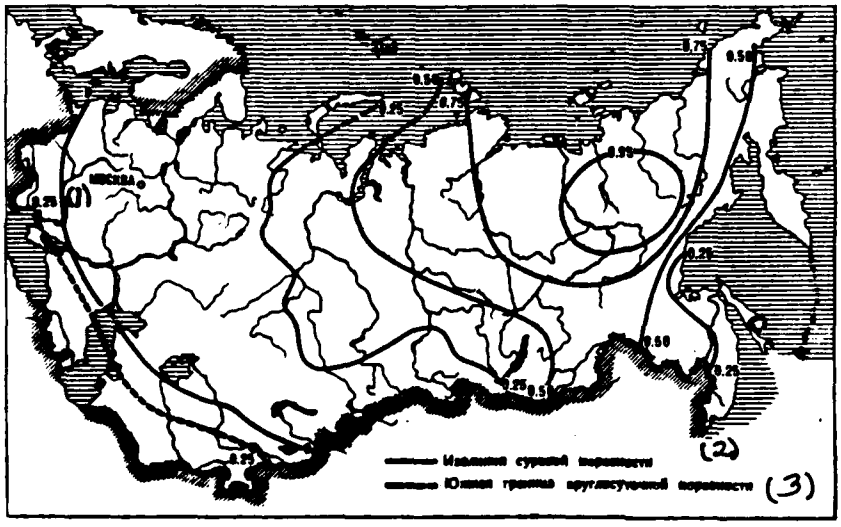

Fig. 2. Schematic map/chart of the distribution of severe frigidity and the boundary of 24-hour frigidity (K=0.25).

Key: (1). Moscow. (2). Isoline of severe frigidity. (3). Southern boundary of 24-hour frigidity.

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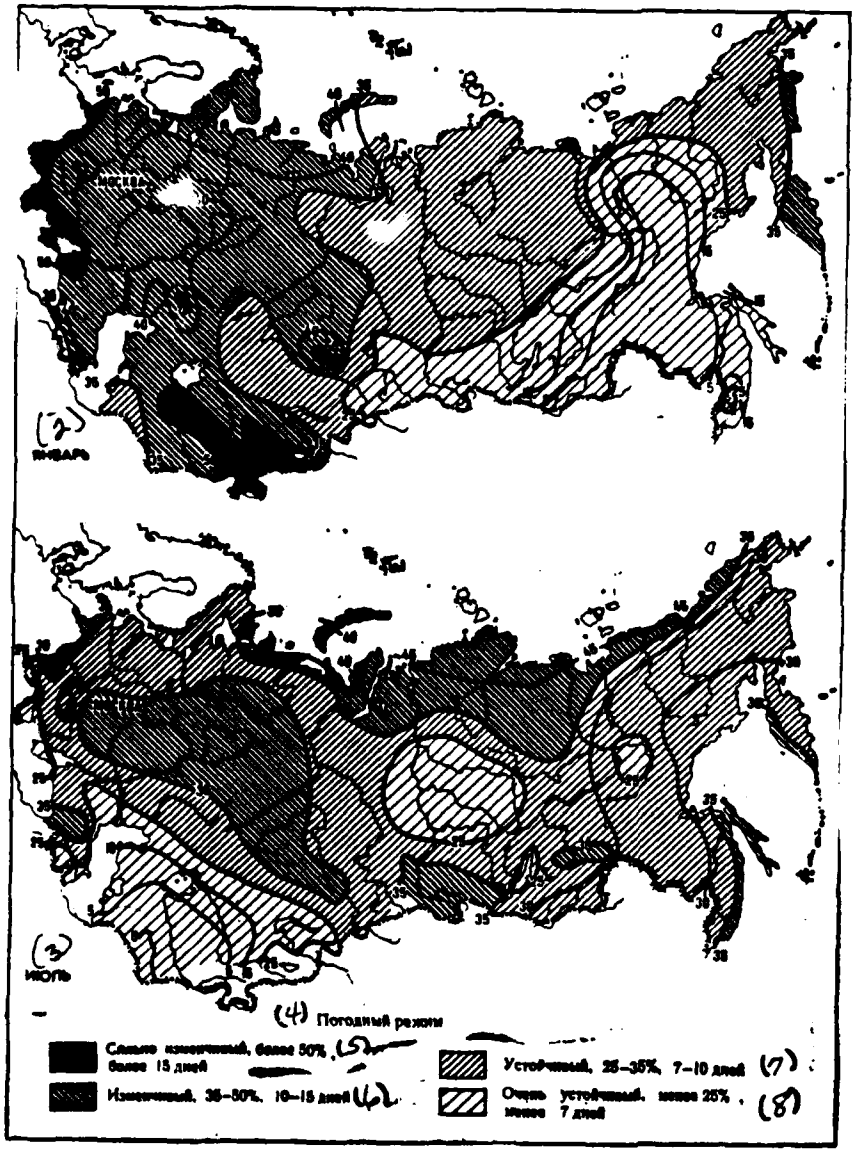

Fig. 3. Schematic map/chart of frequency (%) of contrast variability of weather: a) during January, b) during July.

Key: (1). Moscow. (2). January. (3). July. (4). Weather mode/conditions. (5). Strongly variable, is more than 50%, more than 15 days. (6). Variable, 35-50%, 10-15 days. (7). Stable, 25-35%, 7-10 days. (8). Very stable, is less than 25%, less than 7 days.

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Is considered the contrast variability of weather only such variability, which leads to the substantial change in the physiological functions of organism (crust activity, respiratory/breathing gas exchange, etc.). The contrast variability of weather most frequently is observed with the passage of the active atmospheric fronts, i.e., such, which are well expressed by an abrupt change in many elements/cells of weather complex. As an example can serve the following diagram of the consecutive exchange of the weather: III→VII (transition of sunny, moderately humid weather into the rainy). Example of a low-contrast weather change - gradual transition of sunny, moderately humid weather into the solar hot and the dry and then even into very hot and very dry (III→III→II→II→I).

Laws governing geographical distribution of contrast variability of weather are explained with the aid of calculation of its frequency (expressed in percentages of all days month). Such calculations with the subsequent construction of the schematic maps/charts of the

contrast variability of weathers for January, April, July and October throughout the entire territory of the Soviet Union were made by E. M. Baybakova et al. (1966). In this case the following modes/conditions of weather were distinguished: very stable (<25%), stable (25-34%), variable (35-50%) and strongly variable (>50%).

On all maps/charts strongly variable mode/conditions of weather (with exception of July, when this mode/conditions it is absent) is spread, where cyclonic activity becomes apparent most vividly. In winter (Fig. 3) this southwest and the south of European is particular to the USSR (coast of the Black and Azov Seas), and also the south of Central Asia. The very stable operation of weather is extended in the region of Asian anticyclone. During July the increased variability of weather is noted in the west and southwest European territory of the Soviet Union.

Areas with variable and moreover strongly variable mode/conditions of weather cover those parts of territory of Soviet Union, where in this or another season should be expected possibility of greatest manifestation of disadaptation meteorological neuroses.

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appear frost weathers (in Churuk to 80%) upon direct invasion of cold air from the north or under the conditions of the formed southwestern part of the periphery of siberian high. In connection with this on northwest of republic a number of days with the average/mean daily temperature - 5° during January composes 15, during February - 12.

Warm winter in southern part of territory, where average/mean January temperature 2.1 and 3.3° (respectively in Termez and Sherabad). Weathers with the transition of temperature through 0° and frostless here in winter predominate. However, frost weathers are very rare (Table 4).

In mountain health resort localities/terrains weathers with transition of temperature through 0° predominate, it is weak and moderately frost.

Distinctive features of winter season - instability of weather. During the winter the periods of cold and cloudy weather with the precipitation are alternated with the considerable thaws.

Table 3. **Frequency of the classes of weathers during** October, %.

(2) Пункты	(1) Классы погод									
	I	II	III	IV	V	VI	VII	VIII	IX	X - XI
(3) Чурук	—	4	29	7	7	5	4	9	33	2
(4) Муйнак	—	1	78	10	6	3	2	—	—	—
(5) Тамды	3	33	44	3	2	2	3	—	10	—
(6) Бухара	—	11	75	1	3	—	1	—	9	—
(7) Термез	—	20	74	2	2	—	1	—	1	—
(8) Ташкент	—	14	64	5	5	1	8	—	3	—
(9) Акташ	—	29	43	7	2	3	11	1	4	—
(10) Чимган	—	4	46	12	5	6	13	3	11	—
(11) Шахимардан	—	20	54	10	2	2	7	—	5	—
(12) Минчукур	—	7	67	9	2	2	3	4	6	—

Key: (1). Classes of weather. (2). Points. (3). Churuk. (4). Muynak. (5). Tamdy. (6). Bukhara. (7). Termez. (8). Tashkent. (9). Aktash. (10). Chimgan. (11). Shakhimardan. (12). Minchukur.

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In connection with this the republic as a whole is characterized by the variable mode/conditions of weather with the contrast exchanges

Table 2. Frequency of the classes of weathers during July, %.

(2) Пункты	(1) Классы погод						
	I	II	III	IV	V	VI	VII
(3) Чурук	75	18	—	5	1	1	—
(4) Муйнак	13	39	39	3	4	1	1
(5) Тамды	97	2	—	—	—	1	—
(6) Бухара	76	24	—	—	—	—	—
(7) Термез	96	4	—	—	—	—	—
(8) Ташкент	69	29	—	2	—	—	—
(9) Акташ	58	30	3	6	—	—	3
(10) Чимган	11	50	23	11	—	2	3
(11) Шахимардан	40	32	11	10	1	2	4
(12) Минчукур	19	70	6	4	1	—	—

Key: (1). Classes of weather. (2). Points. (3). Churuk. (4). Muynak. (5). Tamdy. (6). Bukhara. (7). Termez. (8). Tashkent. (9). Aktash. (10). Chimgan. (11). Shakhimardan. (12). Minchukur.

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The passage of the southern cyclones causes a considerable increase in the temperature of air by winter, and in this case maximum temperature can reach 20-25°. Relative humidity descends. Atmospheric pressure strongly falls. In the foothills are developed the foehn winds, is amplified the "Ursatiyevskiy" wind.

In winter formed southwestern part of periphery of Asian anticyclone - most frequently observing synoptic position, whose frequency are approximately 30-40% of all days of month. When this position is held for long, in Central Asia enters from the northeast Siberian air - then stands clear, with the light breezes weather.

Ust'yurt areas, where on latitude of 45° average/mean January temperature proves to be below - 11°, in plains part of republic are in winter characterized by lowest temperatures of air. Here in winter

In the course of all winter months PVFZ is arranged/located somewhat south Central-Asiatic republics, which leads to exceptional activity of cyclonic activity in territory in question. Cyclonic breaches/inrushes from the south achieve the greatest development during February.

frequency of weather with the transition of temperature through 0° exceeds 40% and moderately frost weather (Table 3) even appears.

On mountain health resorts during October together with weather of III class number of cloudy and rainy weathers increases, weathers with transition of temperature through 0° appear. The mode/conditions of weather as in summer, very stable, the contrast exchanges of weathers are infrequent.

In first half of autumn through entire republic it is possible to successfully carry out climatherapy. In the beginning of November cyclonic activity becomes more intense, weather deteriorates, comes the characteristic to cold half-year period of rains.

Winter. Characteristic features of the beginning of winter - smallest values of radiation balance, weakening the biological activity of ultraviolet radiation to the weak, the predominance of the winter types of circulation processes, and also the possible appearance of snow cover in the plain and the establishment of stable snow cover in the mountains.

Ratio of actual sunshine to possible during January comprises less than 50%. The number of days of sunshine during December and January is smallest in the year.

kidney patients (for example, the health resort of Bayram-Ali in Turkmenia and the sanatorium "Sitora and Mokhi Khosa" near Bukhara). With heliotherapy due to the large solar intensity in the health resorts of Uzbekistan extensively are used louvered and perforated/punched sun screens without the fear of overheating organism even at noon.

In limits of low-mountain and middle upland areas in summer months weathers of II and III classes (Table 2) have high forming climate value.

On mountain health resorts in Aktash, in Shakhimardan conditions of comfortable heat-sensation during July compose 80-90% of days, in high-mountain belt/zone (Minchukur) - altogether only about 10% of days.

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Autumn. Beginning of autumn - best pore in the zone of desert. At this time summer heat ceases, but warm and sunny weather is retained. In the south weathers of the III and partially II classes predominate. Almost the same weather is in the middle part of the republic and in the plain in the Fergana/Fergan valley; it is most cold in the northwestern part of the republic - in Churuk: the

flux in the atmosphere (for the evaporation it goes very little), what is the basic energy basis of the formation of very hot and very dry weather.

In summer months it in plain is held for period of almost all days, in connection with which frequency of contrast variability of weather it is small. Daytime temperatures are high and frequently exceed 30-35° even 40°. Because of the large dryness of air, and also the wind high daytime temperatures by local residents and by the acclimatizing themselves people are transferred comparatively easily. However, for the persons, not adapted to these conditions, the danger of overheating during the summer days is considerable.

Differences in desert climate and oases in warm period of year are expressed very vividly. In essence, as it was shown by Ya. I. Feldman (1950), this becomes apparent in the smaller frequency in the oases in comparison with the desert of very hot and very dry weathers. This is explained by the fact that the rich vegetation of oases and their water contaminability decrease daytime temperatures and increase relative air humidity. In summer, especially during the hot days, the most favorable conditions of heat-sensation in the plains are observed by the early morning, in the evening and at night, approximately/exemplarily from 21 hour to 9 hours. The stability of hot and dry weathers is in summer favorable for the

Table 1. Frequency of the classes of weathers during April, %.

(2) Пункты	(1) Классы погод									
	I	II	III	IV	V	VI	VII	VIII	IX	X+XI
(3) Чурук	—	15	27	9	4	5	4	3	33	—
(4) Муйнак	—	3	67	6	6	3	4	4	7	—
(5) Тамды	6	32	30	12	4	6	7	0	3	—
(6) Бухара	2	24	38	11	4	7	9	1	4	—
(7) Термез	8	29	32	13	6	3	9	—	—	—
(8) Ташкент	3	14	39	13	9	3	16	1	2	—
(9) Акташ	—	4	24	13	4	11	40	2	2	—
(10) Чимган	—	3	30	12	3	4	25	7	16	—
(11) Шахимардан	—	8	48	12	9	3	14	2	4	—
(12) Минчукур	—	6	32	17	1	3	18	14	6	3

Key: (1). Classes of weathers. (2). Points/items. (3). Churuk. (4). Muynak. (5). Tamdy. (6). Bukhara. (7). Termez. (8). Tashkent. (9). Aktash. (10). Chimgan. (11). Shakhimardan. (12). Minchukur.

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Daily value of total radiation in weathers I, II, III classes reaches to 600-740 cal/cm² in plain and to 800 cal/cm² under conditions of open mountain locality.

In summer planetary upper-level frontal zone (PVFZ) is placed north of Central Asia, in connection with this cyclonic activity flows/occurs/lasts very limply. In second half of June as a result of the intense heating of the surface layers of soil and soil are noted the first cases of thermal depression, which then sufficiently stably is held during July and August. In the desert areas in summer almost entire radiation balance is expended/consumed on the turbulent heat

Summer. Because of the stable cloudless weather and the considerable inflow of solar radiation at the end of April in the south and in the middle of May on the north of territory prolonged hot summer begins. The ratio of actual sunshine to the possible in summer months is approximately 90%, and the number of days of sunshine - 320-400. Value of total radiation during July in Tashkent 20 kcal/cm², and in Termez - even 21 kcal/cm².

In connection with large duration of day and considerable midday altitude of sun, and also powerful/thick inflow of total radiation for summer in entire territory ultraviolet radiation is most intense. With the zoning of the territory of the USSR for the character of biologically active ultraviolet radiation V. A. Belinskiy et al. (1968) related Uzbekistan to the zone of surplus ultraviolet lighting. This affirmation we accept, but with that stipulation, that surplus ultraviolet lighting is here observed only in the daytime in summer months.

During April in mountain localities frost weathers disappear and sharply are reduced weathers with transition of temperature through 0°. To the height/altitude of 2100 m predominate frostless weathers (in Shakhimardan - about 95%, Chimgan and Minchukur - 77% of cases).

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Spring months are most moistened. Rainy and other weathers with the precipitation (weather of the IV and V class) in spring throughout entire territory comprise to 15-25% of days in month, and in the mountain localities - by places to 45% (Aktash).

In spring mode/conditions of weather are unstable. One and the same weather is held into basic not more than one - three days. The instability of weather in the beginning of spring (during March) leads to the formation of variable weather mode/conditions in the entire territory with the predominance of the contrast exchanges of weather (to 10-15 days in month). However, during April the processes of transformation of an air mass are more intense, why the contrast variability of weather becomes not so frequent. In connection with this the plains part of the territory during April is already characterized by stable weather mode; however, on the mountain health resorts of Chimgan and Aktash the contrast exchanges of weathers during April are still 13-15 days in month.

southwestern periphery of anticyclone) is observed. Days with the breaches/inrushes of the southern cyclones it becomes more than in winter. The summer types of synoptic positions appear.

Radiation and circulation conditions in different parts of territory are dissimilar. This leads to the fact that in the spring months of weather, which appear in different areas, essentially they are distinguished.

On northwest of republic (Churuk, Muynak) during March frequency of frost weathers and weathers with transition of temperature through 0° is still considerable. Average/mean monthly temperature here about 0°. In the south, in Termez, the weathers with the transition of the temperature through 0° during March are only 10%. Weathers of the III class predominate. Average/mean monthly temperature of air of approximately 12°. In second half of spring - during April in the northwestern part of the territory sharply are reduced the weathers with the transition of temperature through 0°. However, in the remaining places in the plain they completely disappear, at this time frostless weathers with a sunny day most frequently are observed. In essence this of weather of the III class, and only in the south, for example in Termez, weathers of the II and even I class in the totality are approximately 40% (Table 1).

maximum in spring. Although the real evaporation in the deserts is small however evaporability (theoretically possible evaporation from the water surface) because of the large sums of solar heat, high temperatures and very low relative air humidity (especially in summer) is very considerable. In the plain it exceeds 1000 mm, and it reaches by places 2000 mm.

On the basis of our studies of climate of different localities/terrains, located in northwestern part of republic (Churuk), in lower reaches of the river of Amu-Dar'ya, on the shore of Aral sea (Muynak), in center of desert Kyzyl Kum (Tamdy), in foothill oasis (Tashkent), in oasis of desert Kyzyl Kum (Bukhara), in very southern oasis (Termez), and also in Tashkent region (Aktash - 1100 m, Chimgan - 1450 m), in Fergana/Fergan valley (Shakhimardan - 1550 m) and in high mountain region (Minchukur - 2100 m), by method of complex climatology (Baibakov, etc., 1963) it is possible to give his characteristic in weathers on seasons.

Spring. Of February to March with an increase in the arrival of solar heat the temperature of air rapidly rises. Spring begins in the southern part of the republic in second half of February, and on the remaining part - during March. The value of total solar radiation during April grows/rises with respect to February 2 times. The decrease of the winter types of synoptic processes (especially

On biological activity of ultraviolet radiation almost entire territory of Uzbekistan can be attributed to V zone (with absence of ultraviolet starvation in winter and with predominance of strong biological activity in the course of 7-7.5 months) (Il'icheva, 1963). The annual values of radiation balance vary from 43 kcal/cm² on the north to 67 kcal/cm² in the south. A quantity of solar heat is here sufficient for its use in the thermal installations, suitable for the diverse targets (Petukhov, 1952, 1953). In the large/coarse oases and in many mountain areas, where health resorts are located and the therapeutic localities/terrains, the sun it is utilized as climato-therapeutic factor. In the cold season for amplifying the local effect of heliotherapy it is possible to recommend the Bukhman reflector.

Position of republic in center of vast continent, in enormous removal/distance from oceans causes aridity and continentality of its climate. In the considerable territory of plains part the annual amount of precipitation is only about 100-200 mm. The region of the smallest annual amount of precipitation (about 80 mm) is located in the area of the lower reaches of the river of Amu-Dar'ya.

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Precipitation drops out predominantly into cold half of year with the

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Z. Makhamatillayev.

CLIMATE OF UZBEKISTAN IN WEATHERS.

Uzbek SSR is located in the desert zone, provided with a large quantity of solar heat. Inflow of heat is here considerable not only because of the location of this zone near the subtropical zone, but also as a result of the fact that the conditions for atmosphere circulation above the deserts of Central Asia favor the development of downcurrents (Wolfson, 1951), with how is connected the frequent formation/education of clear and light cloud weather. As a result both in the sum in the year and in separate months here the greatest insolation duration and greatest quantity of solar radiation in the limits of the Soviet Union. The annual sum of sunshine composes 2600-3000 hours, while in Moscow - 1800 hours area. An annual quantity of total radiation varies from 140 kcal/cm^2 on the north to 160 kcal/cm^2 in the south.

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to 15 days in month.

In general terms winter weather of southern and middle part of territory with frequent exchange of warm days by light frost is similar to unstable weather of autumn in center of European part of country.

But even in winter months on health resorts and in therapeutic localities/terrains of Uzbekistan are favorable conditions for conducting different forms of climato-procedures, such, as heliotherapy with use/application of tape/film material, stay in open air, dosed walking.

Table 4. **Frequency of the classes of weathers during** January, %.

(2) Пункты	(1) Классы погод										
	II	III	IV	V	VI	VII	VIII	IX	X+XI	XII	XIII
(3) Чурук	—	1	—	—	—	—	8	12	50	24	5
(4) Муйнак . . .	—	1	—	—	2	—	20	15	58	4	—
(5) Тамды	—	5	2	3	5	1	16	26	35	7	—
(6) Бухара . . .	—	9	6	2	6	2	15	48	12	—	—
(7) Термез . . .	—	25	7	3	6	4	10	42	3	—	—
(8) Ташкент . . .	1	24	6	3	1	5	10	35	15	—	—
(9) Акташ	—	9	2	1	4	6	25	20	32	1	—
(10) Чимган . . .	—	—	—	—	—	1	27	30	36	6	—
(11) Шахимардан .	—	2	—	—	—	—	13	62	21	2	—
(12) Минчукур . .	—	5	1	—	—	—	23	39	32	—	—

Key: (1). Classes of weathers. (2). Points/items. (3). Churuk. (4). Muynak. (5). Tamdy. (6). Bukhara. (7). Termez. (8). Tashkent. (9). Aktash. (10). Chimgan. (11). Shakhimardan. (12). Minchukur.

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CLIMATE OF THE WESTERN PAMIRS IN WEATHERS

G. P. Lazarenko

Tadzhikistan - country of the most complex relief and climatic contrasts. Here is found one of the highest uplifts/rises - desert Pamir upland with medium altitude of 3500-4000 m, limited from the west by the majestic ridges/spines, where in the region of perpetual glaciation the most grandiose glaciers are arranged/located, such, as Fedchenko, Garmo, Sugran, Gando, etc. Hence begin the picturesque intermountain valleys, which in the south convert/transfer to the vast submontane plains, where subtropical vegetation wonderfully is developed and fine-fibred cotton plant gives the richest harvests. With the deserts of the eastern Pamirs, where hardly drop out 100 mm of precipitation per annum, neighbor mountainous regions with the amount of precipitation during the same period of 2000 mm.

It is natural that structure of climate in weathers, comprised for a few points/items, cannot characterize entire diversity of climatic areas of territory.

Because of southern position and abundance of clear days Tadzhikistan obtains enormous quantity of heat, which is manifested even in high-mountain regions, where because of increased stress/voltage of solar radiation on height/altitude of 3500 m wheat can ripen, and unique botanical garden created in recent decades

under Khorog testifies about richest agroclimatic resources/lifetimes of this edge.

Only enormous heights/altitudes above sea level in combination with special features/peculiarities of relief can create climatic areas, similar to basin of Yblunkul' lake, where winter minimums of temperature are almost yearly omitted below - by 50°, but where pasture vegetation, which completely satisfies unpretentious yaks, in summer appears. At the same time more northern station Irkhit, arranged/located on the shore of the Sarez lake, on the same height/altitude, it strikes with the softness of its climate, which seems improbable for this height/altitude.

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Similar contrasts are possible at the lower level; are sufficient to indicate the very cold basin Shuroabad, which is found on the height/altitude of approximately 2000 m, near which on the opposite slopes of ridge/spine Khozretishi are arranged/located some of the best climatic areas of republic (valley Iola, Dashti-Dzhuma, etc.). Our investigation concerns only the coast ofPyandzhariver and covers areas sufficiently different in the height/altitude and in the form of relief.

Pyandz river and its basic inflows are conceived in region of first-class glaciers. At first river flows from the west to the east along the relatively wide valley, but, when on its way arise the majestic spurs of hindu kush - the mountain Safedkhirs, it turns to the north, it enters into gorge and, after obtaining to the right the series/row of large/coarse inflows, again, but already more gently it turns to the southwest and the west. There it emerges in the plain, widely it spills, is divided/marked off into the separate hoses/pipes and after merging/coalescence near lower Pyandzh with Vakhshyaya river is called name Amu-Dar'ya.

In the present work climate in weathers on three points/items of coast of Pyandzh (Kalai-Khumb, Rushan, Khorog), arranged/located in mountains on height/altitude from 1200 to 2100 m and in plain (lower Pyandzh) on height/altitude of 300 m is examined.

Basic part of population of Tadzhikistan lives in intermountain valleys (Fergana/Fergan, Zeravshanskaya, Garm), also, in South submontane plains, irrigated by water of Kyzylsu, Vakhsha and Kafirnigan.

If mountain valleys are located in comparatively favorable climatic conditions, then South plains are characterized in summer period by extremely high temperatures and they at times undergo

action of "Afghan" - local very high wind, dust haze after which is held in air on several/somewhat days and is transferred by wind upward along mountain valleys to enormous distances.

Station lower Pyandzh sufficiently reliably characterizes climate of southern submontane valleys, despite the fact that nearness of large river somewhat increases background of humidity, which, however, is characteristic for entire irrigation zone of plains Tadzhikistan. Other three stations give representation about the climatic special features/peculiarities, which it is possible to meet in the southern middle upland areas.

In middle part of valley Pyandzh are numerous mineral sources, which also must be for health resort specialists of definite interest. One part of these sources uses the distinguished reputation (for example, Garm-Chashma), another needs the detailed investigation (numerous sulfuric sources in the headwaters of Pyandzh and the series/row of others).

Accompanying tables present structure of climate in weathers with elaboration of 1 classes according to Ya. I. Feldman (1950).

As can be seen from Table 1, in lower Pyandzh in summer period weathers I and II classes are observed in 99-100% of cases with

explicit predominance of I class of average/mean and intense form, but is encountered severe/cruel form.

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Table 1. Structure of a climate in the weathers, % (St. Lower Pyandzh, the height/altitude of 330 m).

(1) Класс погоды		(2) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	(3) За год
(4) Очень жаркая и очень сухая	(5) ж.						0	3						0
	(6) ун.					0	7	26	5					3
	(7) ср.					13	72	66	69	4				19
	(8) сл.			0	1	28	15	5	24	45				10
(9) Жаркая и сухая	(10) б/в			0	12	27	3		2	34	9			7
	(11) с/в				6	7	2		0	2	2			2
(12) Малооблачная		14	32	51	43	8				15	80	46	16	25
(13) Облачная днем	(14) б/ос	3	10	9	11	5			0		4	5	6	4
	(15) с/ос	1	3	5	5	2						2	1	2
(16) Облачная ночью	(17) б/ос	4	3	5	3	2					1	3	5	2
	(18) с/ос	1	1	2	4	2						1	2	1
(19) Пасмурная		6	5	5	3	2	1				2	3	9	3
(20) Дождливая		9	8	13	11	4	0				1	7	8	5
(21) С переходом температуры через 0°	(22) облачный день	15	10	4								4	14	4
	(23) ясный день	42	25	6	1						1	27	36	12
(24) Слабо морозная		2	1	0								0		0
(25) Умеренно морозная	(26) б/в	1	2									2	3	1
	(27) с/в	2												0
(28) Дни малооблачные без осадков и ветра днем		65	73	73	75	85	97	100	100	98	95	84	68	84

Key: (1). Class of weather. (2). Months. (3). In year. (4). Very hot

and very dry. (5). hit. (6). int. (7). medium. (8). weak. (9). Hot and dry. (10). without water. (11). with water. (12). With few clouds. (13). Cloudy in the daytime. (14). without precip. (15). with precip. (16). Cloud at night. (17). Cloudy. (18). Rainy. (19). With transition of temperature through 0°. (20). cloud day. (21). clear day. (22). Weakly frost. (23). Moderately frost. (24). Days light cloud without precipitation and wind in the daytime.

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In spring and in autumn predominate weathers III, during May and September - II classes, and in winter - weather with transition of temperature through 0° with clear day (to 42% during January). Frost weathers are encountered extremely rarely - from 1 to 3% in the month, in this case only weak and moderated.

Thus, judging according to data of station lower Pyandzh, for southern submontane valleys they are characteristic: very warm, predominantly light cloud winter and dry hot summer, when uncomfortable conditions frequently are created. Places these conditions are still worse (in the lower reaches of the river Kafirnigana, for example).

Tables 2, 3 and 4 present structure of climate in weathers about

middle upland areas. They are arranged/located in the eastern and northeastern part of the curve of Pyandzh, in the place of its merging/coalescence with the large/coarse inflows (Gunt, Bartang and less considerable Khumb-Ou). The height/altitude of stations grows/rises from the north to the south.

Kalai-Khumb, arranged/located almost on 1000 m higher than lower Pyandzh, is characterized by very nearly the same soft winter: frost weathers here still less; during January, for example, only 2% of cases of moderately frost weathers, while those of weathers with transition of temperature through 0° - more than 70%. Cloudy and rainy weathers is here more, since of all points/items in question Kalai-Khumb is most rich in precipitation (almost 500 mm per annum), and they are observed not only into the cold half-year and in spring, but also even in summer. Nevertheless, that predominate spring in autumn remain weathers of the III class, although they have lower temperature background. Weathers of the II and especially I class up to the averages and even intense ones in summer sharply predominate.

At heights/altitudes of order 2000 m (Rushan, Khorog) already considerably more than frost weathers (to 65-75% during January), predominantly moderated, but they are observed, as a rule, only in winter months, when are frequent transitions of temperature through 0° (in Khorog during January to 35%).

For first spring month weathers of VIII and IX classes are characteristic, but already from April begin stably to predominate weathers of III and partly VII classes. The same course of weather is observed also in the autumnal months, when during October weathers of the III class prevail, and during November - IX.

However, as far as summer period (June-September) is concerned, even at height/altitude of 2000 m predominate weathers I and II classes. In Rushan in this case are frequen even the arid weathers of average/mean intensity, while in the separate years and intense. September randomly have not related we to summer period - because of the shift/shear of season in the mountains to the later period. June is frequently similar to the spring month, the warm - August, and September according to the character of constantly/invariably warm and dry weathers can be related faster to summer, than to the autumn.

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Table 2. Structure of climate in weather (St. Kalai-Khumb, height/altitude of 1285 m).

(1) Класс погоды		(2) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	За год (3)
(4) Очень жаркая и очень сухая	(5) ин.								2	1				0
	(6) ср.						4	40	39	4				7
	(7) сл.					4	27	30	45	50				13
(8) Жаркая и сухая	(9) б/в			0	5	11	28	12	10	32	18			10
	(10) с/в				0	4	4	1		1	7	0		1
(11) Малооблачная		6	18	45	35	34	12	3	1	8	49	54	20	23
(12) Облачная днем	(13) б/ос	1	4	7	10	11	10	6	1	2	5	5	6	6
	(14) с/ос	1	3	7	8	9	3	0	1		4	3	6	4
(15) Облачная ночью	(A) б/ос	2	5	6	5	3	1		0	1	4	4	6	3
	(16) с/ос	2	3	6	7	3	2	2	1	1	2	3	3	3
(16) Пасмурная		1	2	2	4	6	3	3			5	3	3	3
(17) Дождливая		3	14	18	26	18	6	3	0		5	15	18	10
(18) С переходом температуры через 0°	(19) облачный день	20	12	0								0	2	3
	(20) ясный день	52	39	9							1	13	36	18
(21) Слабо морозная		0												
(22) Умеренно морозная	(9) б/в	11												1
	(10) с/в	1												
(23) Значительно морозная	(9) б/в													
	(11) с/в													
(24) Дни малооблачные без осадков и метр дием		74	69	73	62	66	84	93	99	99	79	79	71	79

Key: (1). Class of weather. (2). Months. (3). In year. (4). Very hot and very dry. (5). int. (6). medium. (7). weak. (8). Hot and dry. (9). without water. (10). with water. (11). Light cloud. (12). Cloud in the daytime. (13). without precip. (14). with precip. (15). Cloud at night. (16). Cloudy. (17). Rainy. (18). With transition of temperature through 0°. (19). cloud day. (20). clear day. (21). Weakly frost. (22). Moderately frost. (23) Considerably frost. (24). Days light cloud without precipitation and wind in the daytime.

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Table 3. Structure of a climate in the weathers, % (St. Rushan, height/altitude of 1980 m).

(1) Класс погоды		(2) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	год (3) За
(4) Очень жаркая и очень сухая	(5) ин.								0					0
	(6) ср.						1	9	8	1				2
	(7) сл.					1	9	43	55	8				10
(8) Жаркая и сухая	(9) б/в				1	11	50	25	28	48	2			14
	(10) с/в				3	7	7	3	3	7	2	0		3
(11) Малооблачная			4	22	43	28	9	4	2	29	61	19	1	18
(12) Облачная днем	(13) б/сс		1	6	14	22	14	8	2	4	14	10	2	8
	(14) с/ос			3	4	3	2	1		0	1	3	0	1
(15) Облачная ночью	(12) б/ос			5	6	6	1	1	1	1	3	3	1	2
	(14) с/сс			2	2	3	0	0	0	0	1	2		1
(16) Пасмурная			1	3	6	9	5	5	1	2	4	6	3	4
(17) Дождливая			1	14	18	10	2	1		0	2	7	3	5
(18) С переходом температуры через 0°	(19) облачный день	7	18	11	0							4	17	5
	(20) ясный день	16	26	31	3						10	33	41	13
(21) Слабо морозная		2	4	2									4	1
(22) Умеренно морозная	(9) б/в	36	19									12	12	7
	(10) с/в	35	25	1								1	16	6
(23) Значительно морозная	(9) б/в	4	1											0
	(10) с/в													
(24) Дни малооблачные без осадков и ветра днем		56	51	66	69	71	84	90	96	91	91	79	87	75

Table 2. Coupling of weather in Khorog and Dushanbe. (April).

(4) Хорог: Классы погод	(1) Душанбе: (2) Классы погод I	II	III	IV б сс	IV с ос	V б ос	V с сс	VI	VII	VIII	(3) Количество случаев в Хороге	%
III	2+	19	109	9+	8+	3+	7	5+	24+		186	62
IV б/ос			5	1	3				6+	1+	16	5
IV с/ос			2		6		3	1+	4+		16	5
V б/ос			2		1	1	1		6+		11	4
V с/ос		1	5			1	1		6+		14	5
VI			2+	1+			2+	1	4		10	3
VII			5+	2+	6+	1+	3+	1	12		30	10
VIII			2+		1+				1+		4	1
IX			6	3+					2+	2+	13	5
(5) Количество случаев в Душанбе	2	20	138	16	25	6	17	8	65	3	300	100
%	1	6	47	5	8	2	6	3	21	1		100

Key: (1). Dushanbe. (2). Classes of weathers. (3). Quantity of cases in Khorog. (4). Khorog. (5) Quantity of cases in Dushanbe.

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Among this weather in the portion of light cloud fall about 60% of days of month. It is natural that temperatures at this frostless weather in Khorog are lower than in Dushanbe. The average/mean daily temperature of air with it is sufficiently rarely in the limits from 12 to 17°, whereas more frequent in spring - from 7 to 12°. Lower

radiation and advective heat quickening of cases of shaping of frostless weather occurs.

observed when in Dushanbe is established frostless light cloud or cloudy in the daytime weather (III and IV), and in Khorog - moderately and considerably frost (XI, XII) weather.

Coupling of weather mode/conditions in spring carries another character. Spring in Dushanbe begins approximately/exemplarily from second half of February, and to April because of the intense radiation heating and sharp decrease of the frequency of the penetration of cold air masses the supremacy of frostless weather here is established. The average/mean daily temperature in Dushanbe during April more than in 20% of cases is in the limits from 7 to 22°, moreover its value in the gradations from 12 to 17° is noted in half of the days of month. Sometimes already during April in Dushanbe the effect of radiation heating and warm advection from the south can lead even to the formation of sunny very hot and very dry weather (Table 2).

At the same time because of the fact that atmospheric fronts above Central Asia are in spring sufficiently active, frequency of cloudy and rainy weathers in annual variation reaches maximum during April. Maximum average monthly amount of precipitation also falls for this period.

In Khorog area during April with increase in total solar

From analysis of coupling of synchronously appearing classes of weathers it is possible to note following special features/peculiarities. When in Dushanbe occurs the formation of frostless light cloud weather (III class - 57% of cases of frequency), in Khorog at this time in half of the cases appear the weathers with the transition of temperature through 0° (VIII-IX classes), and then moderately frost and even considerably frost (I case). However, with the formation in Dushanbe weather with the transition of the temperature through 0° with a sunny day, and also with the cloud day, in Khorog at this time is observed the stable repetition moderately and of considerably frost weather. However, weather with the transition of the temperature through 0° in Khorog (during the indicated situation in Dushanbe) appears substantially less frequently.

Of considerable interest are cases of contrast weather change between points/items in question. Sharply contrast weathers compose 13%, contrast - 63, low-contrast - 10% of cases, and to the coinciding classes of weathers it falls to 14% of frequency (Table 5).

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Sharp-constrast between Dushanbe and Khorog weathers in essence are

and coinciding classes of weathers additionally are noted in no way.

Analysis of local weather showed that for Dushanbe in winter period high frequency of classes of weathers with transition of temperature through 0° (VIII-IX classes) was characteristic. They are approximately 60%, moreover almost 50% fall in portion of the IX class of weather, which is characterized by a sunny day. To the group of frostless weather at this time fall about third of all days of month. Light cloud weather (III class) in this group composes almost half of all cases, and the frequency of cloudy and rainy weathers - 7%. Weakly and moderately frost weather during January has a frequency to 6% of cases.

However, in Khorog during January prevailing classes of weathers are weakly and moderately frost, whose frequency at this time composes somewhat more than 50%. However, the formation of weathers with the transition of temperature through 0° (VIII-IX classes) is noted during 1/3 days of month, significant part (28%) of them relates to the IX class - to the weather with a sunny day. In contrast to Dushanbe for Khorog at this time the characteristically complete absence of frostless weathers. The frequency of considerably frost weather (XII class) in Khorog composed 11%, but in Dushanbe it was not observed completely.

Table 1. Coupling of weather in Dushanbe and Khorog. (January).

(4) Хорог / (1) Душанбе — (2) Классы погод	III	IV б/св	IV с св	V б/с	V с об	VI	VII	VIII	IX	X+XI б/в	(3) Количество случаев в Хороге	%
VIII	2+		1+	1+	1+		3+	5	3+	2+	18	5
IX	26	2+	2+	2	3	2+	7+	14+	27	2+	87	28
X+XI б/в	28++	3++	5++	4++		2+	7+	10+	101+	12	172	55
X+XI с/в										1	1	1
XII б/в								1+	30+	0	31	10
XII с/в	1++										1	1
(5) Количество случаев в Душанбе	57	5	8	7	4	4	17	30	161	17	310	100
%	18	2	3	2	1	1	6	10	51	6		100

Key: (1). Dushanbe. (2). Classes of weathers. (3). Quantity of cases in Khorog. (4). Khorog. (5). Quantity of cases in Dushanbe.

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Table 1 gives data of coupling of local weather in January on) Dushanbe (classes weathers on horizontal stations - Khorog (classes of weathers on vertical line). Thus, at the intersection of horizontals and vertical lines is shown a quantity of synchronously observed repetition of the classes of the local weather; two crosses noted the cases of sharp-contrast, one - contrast; the low-contrast

the analysis of the coupling of the local weather and the construction of tables are borrowed for L. A. Chubukov and Yu. N. Shvareva (1962), also, S. B. Mamedov (1965). The contrast of the weather, observed in Dushanbe and Khorog, is determined according to the diagram, developed by the central scientific research institute of health resort science and physiotherapy.

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Frost-free period in Dushanbe on the average continues to 240 days; annual amount of precipitation - is more than 600 mm, and approximately/exemplarily to 70% of precipitation it drops out in winter and spring months.

Climate of Khorog besides conservative properties of mountain climate is characterized by moderately soft winter and very warm summer: average/mean monthly temperature during January is equal to -7.9°, during July - 22.8°. Total radiation in the year - about 160 kcal/cm², just as in Dushanbe with the maximum value during July. Annual amount of precipitation in comparison with Dushanbe is less approximately/exemplarily 3 times - 200 mm. Basic amount of precipitation also falls for the winter and spring months.

Through their location compared points/items are found on different high-altitude marks, altitude difference comprises more than 1400 m. The distance between them along straight line exceeds 400 km.

During analysis of many-year mode/conditions of weather as basis of determination of classes of weather classification of E. Ye. Fedorov (1949) and L. A. Chubukov (1949) is assumed; the procedure of

circulation of spastic character (hypertonic crises, assaults of stenocardia) and other forms of disorders (Gerasimenko, 1961).

Problem of present communication/report lies in the fact that to show weather differences, which synchronously appear between Dushanbe (800 m) and Khorog (2080 m) in basic months of seasons of year, on material of decennial period (1955-1964).

Selection for comparison of course of local weather of these cities in essence is explained by the fact that during year aviation is almost only method of movement of people between them. Daily (in the presence of flying weather) ten, and sometimes hundred people from different heights/altitudes of Pamir mountains (for 1 h. of 15 min.) fly over into the trough areas of Tadzhikistan, and the inhabitants of valleys from Dushanbe - to city the Pamir. As is known, these two points/items have essential differences in a climate.

Climate of Dushanbe, regarding A. I. Kaygorodova (1955), is characterized by hot summer and very soft winter. The average/mean monthly temperature of air during only year is not omitted below 0°; in the coldest month - January it is equal to 0,8°, during July - 27,0°.

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COUPLING OF THE WEATHER OF DUSHANBE AND KHOROG (PAMIR).

Ye. K. Kurbansho.

It is known that on the health not only of sick, but also healthy people an essential effect has the exchange of the weather: even in a customary climate the variability of weather causes in the series/row of the persons the meteorotropic reactions (Mezernitskiy, 1937; Danishevskiy, 1961).

More considerable effect exerts change in weather mode/conditions to health of people with passages (especially with takeoff of aircraft) of one climatic area in another or during uplift into mountains. Falling into other weather conditions, man depending on age and different capabilities for adaptation can undergo both positive and negative reactions during entire the adaptive period.

Sharp exchanges of weathers cause in patients headache, vertigo, cardialgia, arthralgia, and also disturbance/breakdown of blood

Consequently, weathers I and II classes in middle upland belt/zone of southern Tadzhikistan should be considered unconditionally favorable for stay of man. Amazingly pure, dry and warm air, majestic mountain ridges crowned by the glaringly glittering snow caps, leave the unforgettable impression in each, who visited these beneficial places. Because of the dryness of air considerable height/altitude is above sea level transferred here incomparably easier than, for example, in Caucasus.

Already from this small survey/coverage evidently, is to what extent peculiar and favorable climate of middle upland regions of southern Tadzhikistan and how widely it can be used in people public health.

Key: (1). Class of weather. (2). Months. (3). In year. (4). Very hot and very dry. (5). medium. (6). weak. (7). Hot and dry. (8). without water. (9). with water. (10). Light cloud (11). Cloud in the daytime. (12). without precip. (13). with precip. (14). Cloud at night. (15). Cloudy. (16). Rainy. (17). With transition of temperature through 0°. (18). cloud day. (19). clear day. (20). Weakly frost. (21). Moderately frost. (22). Considerably frost. (23). Days light cloud without precipitation and wind in the daytime.

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One ought not to draw conclusion that with predominance of weathers of II and I classes of average/mean intensity in middle uplan belt/zone mode/conditions of weather will be the same as in plain? It goes without saying, no. If we admissibly use this expression, then one should say that weathers I and the II classes in the middle upland belt/zone qualitatively differ from the same weathers by plain. In the sections of the Western Pamirs investigated by us weathers I and the II classes are caused by not so much high temperature, whose average/mean daily values at this level almost never attain 30°, as by extremel small humidity, whose daily mean values into the summer and early autumn periods do not exceed usually 25-35%, but sometimes are omitted below 20%. Even into the cold half-year average/mean humidity fairly often is not risen above 40% and it very rarely exceeds 60%.

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Table 4. Structure of a climate in the weathers, % (St. Khorog, height/altitude of 2080 m).

(1) Класс погоды		(2) Месяцы												(3) год
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
(4) Очень жаркая и очень сухая	(5) ср.							3		0				0.2
	(6) сл.						4	37	49	6				8
(7) Жаркая и сухая	(8) б/в					11	42	39	42	50	1			16
	(9) с/в		0		2	4	3	3	1	3	3			2
(10) Малооблачная			1	22	60	49	28	6	4	33	68	15	2	24
(11) Облачная днем	(12) б/ос		2	2	6	11	17	6	3	5	11	8	1	6
	(13) с/ос		0	1	5	7	1	2		1	1	3	1	2
(14) Облачная ночью	(22) б/ос			1	3	3	1	1		0	1	2		1
	(13) с/ос		0	6	5	6	1	0			2	1	1	2
(15) Пасмурная				1	3	3	0	2	1	2	2	1	1	1
(16) Дождливая			1	8	12	6	3	1			3	6	1	3
(17) С переходом температуры через 0°	(18) облачный день	8	14	11	1							5	11	4
	(19) ясный день	27	43	47	3						8	58	55	20
(20) Слабо морозная		0										0		0
(21) Умеренно морозная	(8) б/в	53	33	1								1	25	9
	(9) с/в													
(22) Значительно морозная	(8) б/в	12	6	0									2	2
	(9) с/в													
(23) Дни малооблачные без осадков и ветра днем		92	86	79	77	80	93	92	98	94	91	85	86	88

Key: (1). Class of weather. (2). Months. (3). In year. (4). Very hot and very dry. (5). int. (6). medium. (7). weak. (8). Hot and dry. (9). without water. (10). with water. (11). Light cloud. (12). Cloud in the daytime. (13). without precip. (14). with precip. (15). Cloud at night. (16). Cloudy (17). Rainy. (18). With transition of temperature through 0°. (19). cloud day. (20). clear day. (21). Weakly frost. (22). Moderately frost. (23). Considerably frost. (24). Days light cloud without precipitation and wind in the daytime.

temperatures are frequent, since they are encountered almost in 25% of cases.

In frequency of cloudy and rainy weathers, which indicates generality of macrosynoptical processes in studied points/items.

Analysis of contrast in weather between Dushanbe and Khorog showed that during April sharp contrasts of weather are not observed: contrast compose 30%, low-contrast - 25 and coinciding - 45% of cases (see Table 5).

In summer time because of especially intense radiation heating of deserts of Central Asia and rapid transformation of different air masses into mass of tropical Turanian air in plains and in low-mountain areas sunny very hot and very dry (I) or hot and dry (II) weathers frequently appear. In Dushanbe, where the "respiration" of desert during July it is still sufficiently perceptible, these weathers appear in more than 90% of cases.

Table 3. Coupling of weather in Dushanbe and Khorog. (July).

(3) Классы погод	(1) Душанбе (2) Классы погод: I сл. инт.	I ср. инт.	II	III	IV б/ос	IV с/ос	V б/ос	V с/ос	VI	VII	(3) Количество случаев в Хороге	%
(4) Хорог. I сл. инт.	53	16	63				2		1+		135	43
II	26	10	85	3	3	1	1		2+		131	42
III	6		7	2							15	5
IV б/ос	3	1	10	2	1						17	5
IV с/ос	0		3+							1	4	1
V б/ос	1										1	1
V с/ос			1								1	1
VI			4+								4	1
VII	1+	1+									2	1
(5) Количество случаев в Душанбе	90	28	173	7	4	1	3		3	1	310	100
%	29	9	55	2	1	1	1		1	1		100

Key: (1). Dushanbe. (2). Classes of weathers. (3). Quantity of cases in Khorog. (4). Khorog. (5). Quantity of cases in Dushanbe.

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In Khorog the local heating of the rocks in summer also is very intense, and air humidity is small. Therefore here, in spite of the considerable difference in a relative height (1400 m) in comparison with Dushanbe, the frequency of the named weathers is also great and reaches 85% (Table 3).

During July differences in weather between Dushanbe and Khorog are smoothed, sharply contrast weathers are not observed, frequency of contrast ones is reduced to 12%; frequency of low-contrast weathers - 38%, that coincide - 50% (see Table 5).

Autumn period under conditions of points/items in question appears as continuation of summer period. In comparison with April October is characterized by more steady running of the local weather, that it is possible to see based on the example of the formation of light cloud weather (III) in Dushanbe. During October in Dushanbe it is approximately 85%, while in Khorog - 70% (Table 4).

Beginning approximately/exemplarily from second half of October it is destroyed thermal depression it occurs intense penetration of air masses to territory of Tadzhikistan, thanks to which frequently with stable formation of sunny weathers is repeated/quickened frequency of cloudy and cloudy with precipitation weathers, which for Dushanbe are approximately 10%, and for Khorog - 20%.

Table 4. Coupling of weather in Dushanbe and Khorog. (October).

(4) Хорог: Классы погод	(1) Душанбе: (2) Классы погод II	III	IV б/ос	IV с/ос	V б/ос	V с/ос	VI	VII	VIII	IX	(3) Количество случаев в Хороге	%
II		5									5	2
III		207	3	1	5	1	2+	3+		2	224	71
IV б/ос		27	3	2	1		3+	1+			37	12
IV с/ос		1									1	1
V б/ос		5			1		1+				7	2
V с/ос		2									2	1
VI		6+						1			7	2
VII		1+				1+		3			5	2
VIII												
IX		16								6	22	7
(5) Количество случаев в Душанбе		270	6	3	7	2	6	8		8	310	100
%		86	2	1	2	1	2	3		3		100

Key: (1). Dushanbe. (2). Classes of weathers. (3). Quantity of cases in Khorog. (4). Khorog. (5). Quantity of cases in Dushanbe.

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As investigations showed, during October in Khorog and Dushanbe greatest number of cases falls to coinciding classes of weathers (III class - 207 cases)

Data of Table 5 testify about that well expressed under conditions of Pamirs of tendency of decrease of contrast of weather

between low-mountain and high-mountain areas in time: winter - spring - summer - autumn.

In autumn occurs as "approach" of weather mode/conditions in area of Dushanbe and Khorog. On the basis of this it is possible to draw the conclusion that during the flights/passages of Dushanbe - Khorog - Dushanbe precisely in autumn it is possible to expect the least frequent meteorotropic reactions of the human organism to this flight/passage.

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Table 5. Frequency of different degree of contract in weather between Dushanbe and Khorog in different seasons of the year, %.

(2) Степень контрастности	(1) Месяцы			
	(3) Январь	(4) Апрель	(5) Июль	(6) Октябрь
(7) Резкоконтрастные . . .	13	—	—	—
(8) Контрастные	63	30	12	6
(9) Малоконтрастные . . .	10	25	38	22
(10) Совпадающие	14	45	50	72

Key: (1). months. (2). degrees of contract. (3). January. (4). April. (5). July. (6). October. (7). Sharp contrast; (8). contrast; (9). Little contrast; (10). Matching.

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VERTICAL ZONATION OF THE LOCAL WEATHER AND ITS BIOCLIMATIC ESTIMATION. [Based on example of Armenian SSR].

A. B. Bagdasaryan, R. A. Bagdasaryan.

Climate, the most important and variable component of geographical shell, and therefore its medical estimation has paramount health resort value.

Special position for health resort targets acquire mountain areas, whose natural conditions considerably differ from plains ones. Specifically, these differences acquire exceptional importance for the therapeutic targets.

If climate, considered as many-year mode/conditions of weather, is subjected in mountains of vertical zonation, then weather mode/conditions of mountain countries also changes on vertical line; therefore during health resort estimation together with study of changes in separate weather constituents according to vertical line is necessary analogous approach also to mode/conditions of weather.

Investigation of climate is important not only for development/detection and evaluating health resort resources/lifetimes, but also for comparative analysis during selection of places of treatment and development of corresponding mode/conditions of climatotherapy.

Mountain climate differs from plains in terms of comparatively complicated structure because with its formation horizontal and vertical properties of zonality are superimposed on each other. During the study of the mode/conditions of the weather of different mountain countries one should proceed from the zone of their location, since on this depend both astro-geophysical and general geographic conditions for the formation of their climatic special features/peculiarities. In the process of the formation of the mode/conditions of weather an effect has not only true altitude, but also special features/peculiarities of relief, in particular the exposure of slopes. The direction of the general/common/total course/strike of large/coarse mountain ridges causes the considerable contrasts of climates of individual sections, creating the versions of high-altitude climatic zonation and, consequently, also the local weather.

On variability and contrast of weathers in mountains it is possible to distinguish three basic types of relief: open slopes and

valleys, locked hollow valleys and mountain plateaus.

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By the mechanism of effect they are divided into two basic groups: the circulation (wind) and solar (insolation) types of mountain constructions. As it will be shown further, these types considerably affect, in the first place, to the height/altitude of the location of different climatic belts, in the second place, they cause inversion or precipitation of separate belts/zones, and with this, it is completely understandable, are connected the special features/peculiarities of the mode/conditions of weather.

In south of Soviet Union on boundary of subtropical and moderate climates circuits of mountain ridges, which are of exceptional interest for health resort targets, are arranged/located. This is the belt/zone of young volcanic mountains with the rich yields of medicinal water, the diverse landscapes and the numerous types of the mountain climates. This region includes Armenian SSR - small mountain country, where on the vertical line is entire/all range of the types of climate, from the dry subtropical to arable. Based on the example to this vertical zonality the picture of the three-dimensional/space and seasonal characteristic of the mode/conditions of weather and its health resort estimation is opened. Thus, here with uplift into the

mountains is observed the exchange of almost all types of climate, characteristic to the vast scopes of the European territory of the USSR, and it can seem that the mode/conditions of the weathers of corresponding zones both in the plain and in the mountains is identical.

However, this is far not so. Because of the specific character of the forming climate factors together with the similarities the mode/conditions of the weather of the vertical belts/zones of subtropics considerably differs from the mode/conditions of the weather of the corresponding horizontal zones. Specifically, this is most valuable for the health resort targets. Weather mode/conditions in the mountains besides the regular decrease with the height/altitude of atmospheric pressure and oxygen content is characterized by the riches of the radiation, in particular ultraviolet, which has important therapeutic value. The considerable difference in the weathers is observed also because of different duration of day and night.

In climatic zones, situated north of subtropics, intensity of atmosphere circulation sharply grows/rises. In connection with this cyclonic weathers there during almost only year predominate, in consequence of which the variability and the contrast of their types to high latitudes gradually grows/rises. Considerable differences in

the character of weather are observed as a result of changes, connected with the phase state of water.

Dry subtropical climate is formed/shaped on foothill slopes of solar exposures of small Caucasus mountains. This climate is characterized by warm slightly snowy winter. Duration of the frost-free period of 220-250 days. A number of days with the frost weather in the winter months does not exceed 7-8. In this case moderately frost weather predominates weakly and. Spring is short, third of days of May with the cloudy and rainy weather.

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The variability of weather into the cold half-year is large, the summer prolonged (order of four months) with the predominance of solar type weathers, with the insignificant variability and the contrast. During this period and in the beginning of autumn the meteorotropic reaction of cardiovascular patients is insignificant. Large inconvenience compose the very hot and very dry weathers, whose frequency in summer months occurs the order of 8 days. The advantage of a subtropical climate in comparison with north latitudes and by high mountain region is expressed in the sunshine, a small variability and the duration of the period of the optimum mode/conditions of weather.

In autumn and in spring climatic and balneoclimatic health resorts of this zone help prolongation of period of climatotherapy. During this period it is here necessary to send those resting from the areas of "solar starvation".

Dry, sharply continental climate is formed/shaped on bottom of Middle Araksin basin and it is most pronounced in area of Ararat valley. In winter in the course of three months more than half of days is characterized by frost type weathers. It is interesting that here and at the apex/vertex of Aragats are observed the cases of strongly frost weather. Because of the inversion cloudiness cloudy weather types are considerable percentage. The weathers with the wind are very frequent. Conditions for heliotherapy in the winter months in this climate are unfavorable. In spring and in autumn the mode/conditions of weather is almost similar/such to subtropical type. In summer predominate very hot and very dry weathers. In the course of four months, according to the average data, there is not a day without the sun. The mountain-valley winds developing after noon facilitate the conditions of stay here.

Mountain landscapes under conditions of predominance of clear weathers cause "major" landscapes, which favorably affect those

resting. Only in the various winters the prolonged periods of weathers with the low cloudiness create gloomy, "minor" landscapes. As a whole the weather here is exceptionally/exclusively favorable for conducting the climato-therapeutic procedures.

Special features/peculiarities of mode/conditions of weather of hot and dry continental (to 1300-1400 m above sea level), moderately hot dry (to 1700-1800 m above sea level) climate in many respects are similar to mode/conditions of preceding/previous belt/zone and are characterized by decrease of number of days with very hot and very dry weather with height/altitude and increase in frequency of light cloud warm nonarid weathers. The health resort Arzni, which has favorable conditions for the heliotherapy, is here arranged/located.

In transient seasons of year with height/altitude variability of weather and number of days with cloudy and rainy weather increases.

Large health resort value present forests of Armenia. Their basic masses are arranged/located on the external open slopes of the Malokavkas mountains. In the forest belt/zone a climate moderately warm, optimally humid and covers heights/altitudes from 1000 to 1800 m.

For the dry subtropical zone, which is characterized by the riches of solar radiation, by arid and continental climate, the forest zone acquires exceptional importance. Winters here are soft, with stable snow cover, with the predominance of weakly frost, moderately frost weathers and weathers with the thaw.

Warm light cloud weathers, which create favorable conditions for winter rest and ski-sport measures, are considerable percentage. Since midday altitude of sun in the winter months is not lower than 25°, and the duration of day - is not less than nine hours, the, naturally, abundance of sunny weathers (monthly sums of sunshine of 120-150 hours) creates exceptional prospects for the creation here of the zone of winter rest of All-Union value.

Almost third of territory of republic occupy highland steppes, whose nature reminds steppe of East Europe. However, because of the relatively high altitudes (1500-2300 m above sea level) the mode/conditions of weather here considerably differs from the latter. This belt/zone is characterized by the riches of solar radiation, whose maximum values reach 1.62 cal/cm^2 per minute. The annual sum of sunshine exceeds 2500 hours, in the winter months it reaches by places 150 hours.

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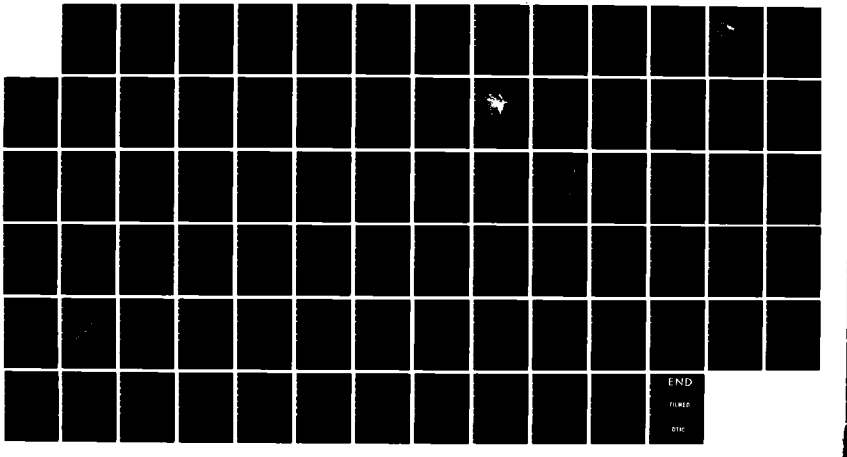

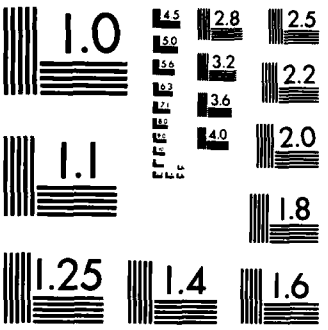

MICROCOPY RESOLUTION TEST CHART
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Middle upland zone is characterized by comparatively even/plane distribution of climatic seasons. They correspond to the calendar seasons of year. In the presence of stable snow cover in winter predominates the frost weather predominantly with a sunny day, whose frequency on the average reaches 20 days. Depending on the character of relief here is observed thawing weather. Since the beginning of March the spring mode/conditions of weather begins, which is caused by the intensification of the inflow of radiant energy, by an increase in the frequency of the passage of cyclones. The variability of weather here in comparison with the preceding/previous types of climate considerably grows/rises, sharply increases the frequency of cloudy and rainy weathers, the thunderstorms are frequent. Summer is warm, with the predominance of light cloud warm weathers. The variability of weather in comparison with the spring decreases, but in the summer period the stability of the weather considerably lower than same of the preceding/previous belts/zones. Because of the increase of humidity with the height/altitude comparatively optimum proportions in the relationship/ratio of heat and moisture are created, in consequence of which here barely there is very hot and very dry weathers. First half of autumn is characterized by warm, sunny weathers, the second - by increase in the cloudy and rainy weathers; grows/rises the variability of weather.

This belt/zone since olden times place of rest of livestock breeders Transcaucasia, and at present in connection with presence of mineral sources, therapeutic peats and promising health resort. This type includes the lake sevang, where wide building is expanded/scanned. Climatic conditions are here favorable not only for the summer, but also for winter rest.

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High-mountain belt/zone is characterized by two types of climate - fresh (2000-2500 m above sea level) and cold (above 2500 m above sea level). Here the most prolonged time of the year - winter (5-6 months) with stable, deep snow cover, predominate frost weathers, solar type weather is high percentage among them. Weather is characterized by a sufficient variability and contrast. At the lower levels warm light cloud weathers still are observed, and in near-peak zone even thaws are rare. Spring also is prolonged, is cold; predominate cloudy, rainy weathers. The summer is short (about two months), is fresh, with the abundance of the solar radiation, especially ultraviolet, in consequence of which more or less prolonged stay in air leads to the sunburn and even erythema of skin. Therefore in the limits of the corresponding mode/conditions

climatotherapy must be strict.

In recent years high-mountain zone of Caucasus is utilized for treatment of patients with disorder of nerve and hemopoietic organs/controls, what, apparently, favors intense radiation, especially ultraviolet, and reduced oxygen content.

Thus, in subtropical zone climate of mountain masses is subjected to pronounced zonation, which causes seasonal and three-dimensional/space change in mode/conditions of weather on height/altitude. The duration of climatic seasons to for middle upland becomes more uniform and it corresponds to the usual seasons of year. To the apical zone cold period gradually increases, while to the foothills - warm. The dynamicity of weather with the height/altitude becomes more intense. The mode/conditions of weather depends also on relief and exposure. The contrast of weathers in the basins and the trough forms sharply grows/rises. Under the conditions of weather for summer rest are most favorable forest and highland-steppe belts, and for the winter - highland-steppe of the internal, locked areas, where solar type weathers considerably predominate.

Middle upland and high-mountain areas of Transcaucasia in climatic sense, especially under conditions of weather, you suitably

differ from mountains of Switzerland and Austria, where numerous world famous health resorts for winter rest are placed. Radiation conditions and variability of weather there is considerably worse than in Transcaucasia mountains.

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FORMATION AND DISTRIBUTION OF THE LOCAL WEATHER IN AZERBAIJAN

S. B. Mamedov.

The complicated relief of the territory of Azerbaijan, the presence of sea, special feature/peculiarity of atmosphere circulation, soils and plant cover create the great variety of climatic and weather conditions.

In this article are used developments, carried out by method of complex climatology on 39 points/items of Azerbaijan, made by both the author himself, and by specialists of institute of geography of Azerbaijan SSR, division of climatology of institute of geography of AS USSR and central institute of health resort science and physiotherapy.

During analysis of genesis and distribution of local weather we adhered to calendar seasons, which allows in view of possibilities of comparison of low and mountain areas more reliably to judge effect of

local special features/peculiarities.

In spring in connection with considerable contrast of air masses invading to territory, differences in value and signs of radiation balance in mountain and low areas weather conditions are characterized by large variability. The dominant role belongs to the light cloud nonarid weather, whose frequency during this period in low-seaside areas composes 60-72%, in the internal lowlands - 50-60%. Exception is the low zone of Cuba-Khachmass mass, where the frequency does not exceed 20%, which is connected with the frequent development here of orographic occlusion. In the frequency of the emergence of light cloud nonarid weather to the first two areas is somewhat inferior the foothill zone of the large and small Caucasus, and also Talysha, where its frequency does not exceed 40-50%. The intensification of convective processes in the mountains leads to the development of daytime, frequently cumulus cloudiness, in particular into second half of day, and making more active of thunderstorm processes. By this is explained an increase of frequency of the IV class of weather during this period in the mountain areas.

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In distribution of cloudy and rainy weathers as a whole and in separate mountain masses and slopes differences are comparatively

small, order 5-15%. These weathers are less frequent in the seaside and internal lowlands, than in the foothill, low-mountain and middle upland areas.

In spring period, in particular into its first half, almost everywhere together with classes of frostless weather are observed weathers with transition of temperature through 0°, while in mountain and high-mountain areas - even it is moderate and considerably frost weathers. In the seaside areas the frequency of weathers with the transition of the temperature through 0° is insignificant - 3-10%, and in the internal lowlands in the beginning of spring - 16-28% (this predominantly of weather with a sunny day). In the foothill areas their frequency into first half of spring period is still considerable and it reaches by places 50-60%. In the separate areas of foothills can be observed moderately frost weathers (to 10%).

In mountain areas in first half of spring period of weather with transition of temperature through 0° and frost prevail. Thus, the frequency of these weathers (VIII-XII classes) by places reaches 80-85%, and in the high-mountain areas - 85-100%. In second half of spring the sharp decrease of their frequency, with exception of the high-mountain areas, where they can be observed in summer, occurs.

In summer large insolation, observed in areas of internal

lowlands during interaction with underlying surface, almost deprived of plant cover, contributes to transition of light cloud nonarid weathers in moderately and arid-arid.

Table. Frequency of very hot and very dry, hot and dry weather in the summer period. (July), %.

(1) Острова и приморская низменность			(2) Внутренняя низменность		
(3) Станция	(4) Классы погоды		(3) Станция	(4) Классы погоды	
	I	II		I	II
(5) Жилой	0	10	(6) Кировабад	25	39
(7) Артем	4	13	(8) Евлах	57	26
(9) Сумгаит	9	14	(10) Жданов	34	39
(11) З. О. Култук	1	33	(12) Кюрдамир	62	20
(13) Хачмас	2	18	(14) Джульфа	80	16
(15) Низовая пристань	0	5	(16) Джафархан	18	36
(17) Мардакяны	6	16	(18) Нахичевань	78	18

Key: (1). Islands and seaside lowland. (2). Internal lowland. (3). Station. (4). Classes of weather. (5). Zhiloy. (6). Kirovabad. (7). Artem. (8). Yevlakh. (9). Sumgait. (10). Zhdanov. (11). Z. O. Kultuk. (12). Kyurdamir. (13). Khachmas. (14). Dzhul'fa. (15). Lower pier. (16). Dzhafarkhan. (17). Mardakyany. (18). Nakhichevan'.

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In connection with this the frequency latter/last them in the internal lowlands in comparison with seaside is considerable (Table).

Arid-arid weathers in seaside areas (according to classification of Feld'man, 1950) in essence weak thinner/less frequent than average intensity in internal lowlands their large frequency fits in cases of

average/mean intensity, less frequent - strong (with average/mean daily temperature of air of more than 32.5% and by low humidity).

Basic reason for formation of arid weathers in territory of Kura-Araksinskaya lowland - value of heat balance and its structure. Arid weathers here to the basin in all are formed in the anticyclonic conditions as a result of the transformation of invading for the territory in question air masses both warm, and cold. Arid weathers appear both in the warm ones and in cold air masses with the specific values of total radiation on the order of 540-660 cal/cm^2 (Mamedov, 1965). The special features/peculiarities of their temporary/time and spatial distribution indicate in essence the insolation character of their emergence. Under the specified synoptical conditions, they are the consequence of the advection of the dry and hot winds due to Caspian Region.

However, in mountain areas even with value of radiation balance equal with lowland frequency of arid weathers is insignificant. This is connected with the fact that the increase in the quantity of summer precipitation with the height/altitude of locality/terrain, observed (to certain, but different height/altitude) almost in all areas of Azerbaijan, leads to the fact that here basic part of heat balance is expended/consumed on the evaporation, and to the turbulent heat flux in the atmosphere insignificant part remains. Together with

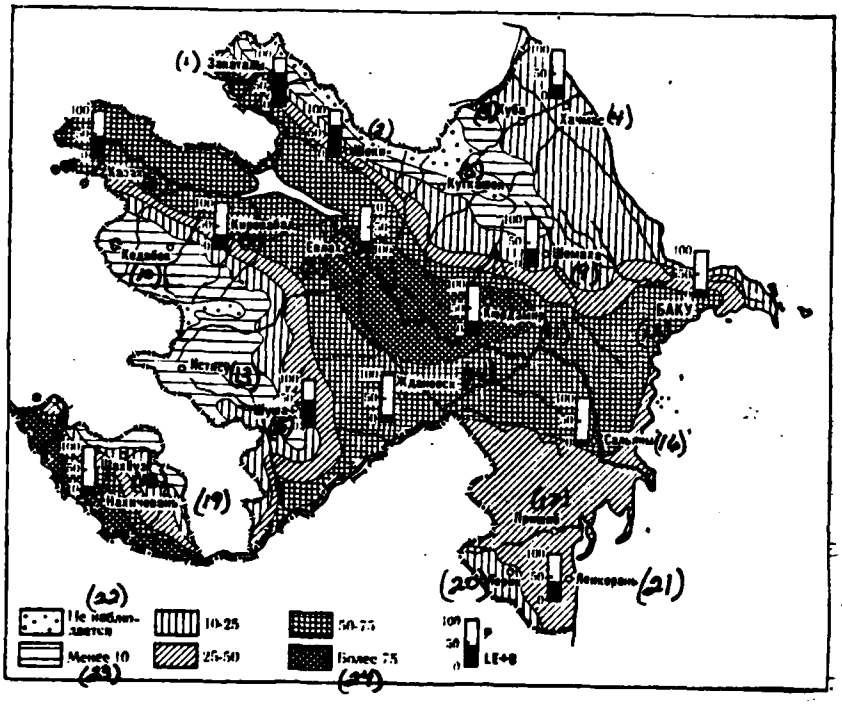

Fig. 1. Frequency of arid weathers (I and II classes) during July and components of heat balance, %.

Key: (1). Zakataly. (2). Sheki. (3). Cuba. (4). Khachmas. (5). Kutkashen. (6). Kazakh. (7). Kirovabad. (8). Yevlakh. (9). Shemakha. (10). Kedabek. (11). Kyurdamir. (12). Baku. (13). Istisu. (14). Zhdanovsk. (15). Shusha. (16). Sal'yany. (17). Prishib. (18). Shakhbuz. (19). Nakhichevan'. (20). Lerik. (21). Lenkoran'. (22). Is not observed. (23). Less than. (24). More than.

the general/common/total reason - a decrease in the temperature of air with the height/altitude - this leads to weakening of warming up in the lowest layer of the atmosphere (Fig. 1). On the value of the frequency of these weathers besides the height/altitude of locality/terrain the exposure and the degree of its forestation is manifested also. Thus, in Fig. 2 distinctly are drawn the curves, which characterize a change in the frequency of arid weathers on the northeastern slopes of a small Caucasus, deprived of the plant cover (I), also, with the forest vegetation (II).

Comparison of data on frequency of arid-arid weathers shows that while on northern slopes at height/altitude of approximately 1500 m (Kedabek) they no longer appear, on south (Bist) their frequency composes 6-10%.

Effect, in particular, Caspian Seas on formation and frequency of arid weathers are sufficiently substantial. The specially conducted by us investigations (Mamedod, 1967) showed that it affects a change of the value of the frequency of arid-arid weather in the dependence on the distance from coast curtailment.

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On the islands, arranged/located from the coast on 40-100 km

Into subprovince of a steppe and semiarid climate enter three districts: the district of steppe climate - 1 Is. step. (it occupies the western part of Ciscaucasia to the Kuban in the south); the district of a transient climate from the steppe to the semiarid - 1 Is. per. (to the east from the first); the district of a semiarid climate - 1 Is. polup. (it occupies Caspian lowland).

In summer in this subprovince degree of aridity, mode/conditions of weather and climatic elements/cells change eastwards. Thus, during July the frequency of sunny weathers increases from 22 days in the west in the steppes of Krasnodar edge to 24-25 in the semideserts of Caspian region. In this case due to the light cloud nonarid weathers in this direction the frequency of arid-arid (very hot and very dry) weathers from 2 to 11-12 days increases. Simultaneously the average monthly temperature of air rises from 23° to 24.5°, amount of precipitation decreases from 70 to 30 mm.

In contrast to summer winter in subprovince is changed in essence northwards - from unstable in south to weakly unstable on north. The warm winter is observed in the southwestern part of the steppe district. Thus, during January the frequency of weathers with the transition of the temperature of air through 0° and without the

temperature of air through 0° and frostless from 21 to 30 days (remaining days with the frost weather) winter is considered very unstable from 11 to 20 days - unstable, from 5 to 10 days - weakly unstable and from 1 to 4 days - stable. Stable winters were subdivided on the predominant weathers into the moderately frost ones, it is considerable, strongly and severely/cruelly frost.

Taking into account special features/peculiarities of mode/conditions of local weather and climatic elements/cells, degree of humidification, role and effect of relief, seas, atmosphere circulation, and also character of soil and plant cover on territory being investigated were isolated two climatic provinces of zone of middle latitudes: province, which stretches to height/altitude of 2000 m, and province of high-mountain climate - from 2000 to 5600 m.

In province of zone of middle latitudes with height/altitude of up to 2000 m are isolated three subprovinces: 1 - steppe and semiarid climate of lower Don and Ciscaucasia, 2 - forest-steppe climate that of Ciscaucasia and 3 - low- and middle upland forest-steppe and forest climate. Subprovinces are designated by arabic numerals in the order of their description from 1 to 6, and climatic district - letters.

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CLIMATE OF THE NORTH CAUCASUS AND LOWER DON AND ITS USE BY MAN.

A. A. Nagaytsev.

Combination in the limits of the North Caucasus and lower Don plains, the mountains of the large Caucasus, Black Sea and Caspian coasts determines the great variety of the local weather (and, therefore, a climate), which is revealed/detected well on the basis of the use of all methods of climatological analysis.

Characteristic of climate in this territory is given according to Ye. Ye. Fedorov's classification. In this case we considered necessary the weather of all classes on the conditions of daytime cloudiness and duration of sunshine to combine into three groups: solar ones with the cloudiness from 0 to 5 balls, cloud ones without the precipitation with the cloudiness from 6 to 10 balls and cloud with the precipitation.

For determining severity of winter as criterion mode/conditions of weather during January is used according to many-year data. With the frequency during January of weathers with the transition of the

transition of the temperature of air through 0°. The emergence of considerably frost weathers is frequently conjugated/combined with the intense intrusions of cold air masses. But they, as a rule, are short-term and in the process of transformation on the second or third day convert/transfer in the moderately frost weather, whose frequency in the high-mountain zone is considerable and by places are approximately 60% of all weathers.

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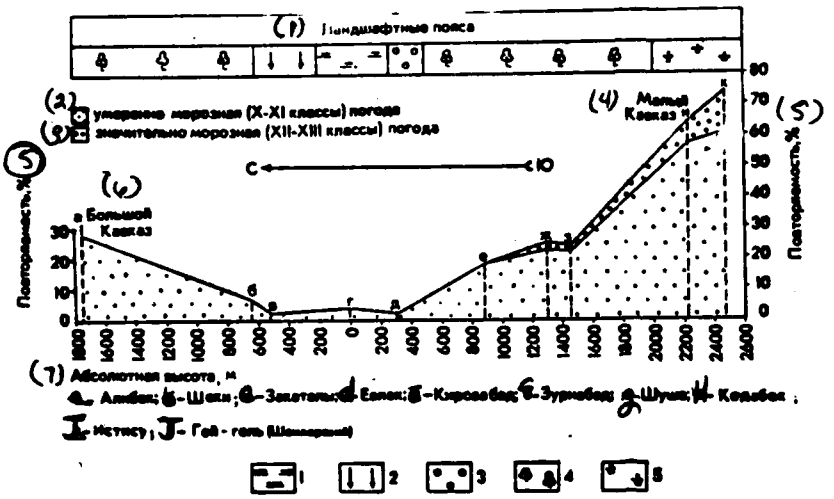

Fig. 4. Change of frequency of frost weathers during January depending on exposure of slope and height/altitude of locality/terrain, %: 1 - semiarid, 2 - semisteppe, 3 - forest-steppe, 4 - forest, 5 - Alpine and subalpine.

Key: (1). Topographical belts/zones. (2). moderately frost (X-X classes) weather. (3). considerably frost (XII-XIII classes) weather. (4). Small and Caucasus. (5). Frequency, %. (6). Large Caucasus. (7). True altitude, m. a - Alibek; b - Sheki; c - Zakataly; d - Yevlakh; e - Kirovabad; f - Zurnabad; g - Shusha; h - Kedabek; i - Istisu; j - Gey-Gel' (Shamkhorskiy).

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The effect of the latter caused the fact that about 30-50% of appearing in these zones weathers compose weathers with the

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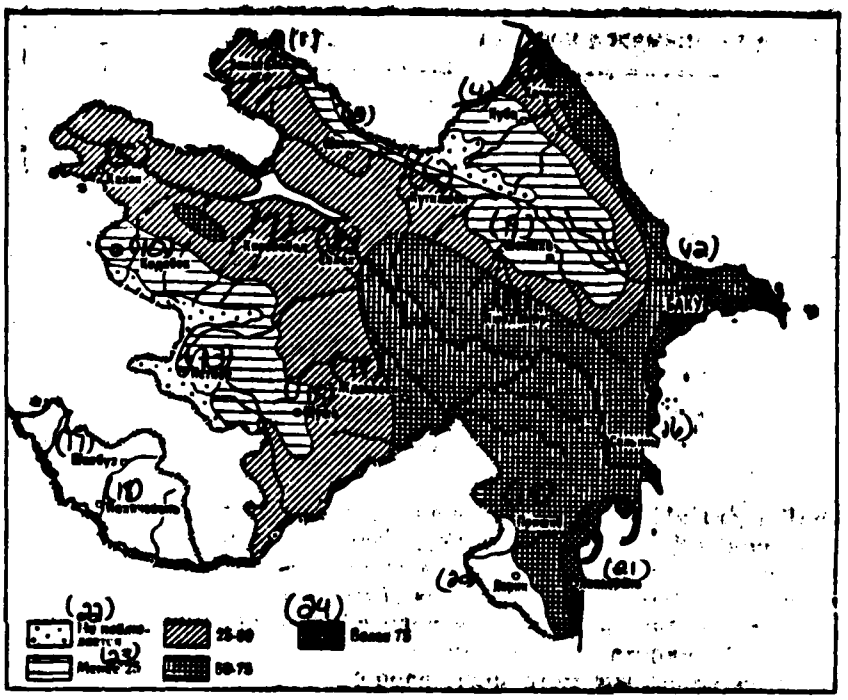

Fig. 3. Frequency of warm weathers (II-VII classes) during December-February, %.

Key: (1). Zakataly. (2). Sheki. (3). Khachmas. (4). Cuba. (5). Kazakh. (6). Kutkashen. (7). Kirovabad. (8). Yevlakh. (9). Shemakha. (10). Kedabek. (11). Kyurdamir. (12). Baku. (13). Istisu. (14). Zhdanovsk. (15). Shusha. (16). Sal'yany. (17). Shakhbuz. (18). Nakhichevan'. (19). Prishib. (20). Lerik. (21). Lenkoran'. (22). Is not observed. (23). Less than. (24). More than.

frost (XII class) weathers. Their frequency in the interval of the heights/altitudes of 1000-2000 m varies respectively from 0 to 10%. In the middle upland zone the windless light cloud weathers, which because of the steady snow covering contribute to the cooling by radiation emission predominantly in the night time, prevail. In the daytime the abundance of solar radiation frequently contributes to an increase in the temperature of air to the positive values.

temperature through 0°, and also frost group. The effect of sea on the formation of weathers in the eastern part of Kura-Araksinskaya lowland in the beginning of winter is more substantially than at the end of it, which is connected with leveling of the thermal difference between the surface of dry land and sea toward the end of the winter season.

In winter the role of the exposure of slope in the formation of the local weather in comparison with the summer period is less considerable. More sharply it becomes apparent in the anticyclonic periods of large duration (Fig. 4). Thus, the northern slopes of a small Caucasus are considerably colder than the southern slopes of the large Caucasus. Foothill areas of both mountain masses are warm than the low zone of Kura-Araksinskaya lowland.

In mountains with an increase in height/altitude (higher than level 500 m) noticeably is changed structure of climatic mode/conditions. In the limits of middle mountains the frequency of weather with the transition of the temperature of air through 0° is great; gradually grows/rises the value of moderately frost weather. On the northern slope of a small Caucasus, beginning approximately/exemplarily from the height/altitude of 1000-1200 m, while on northeastern slope of the large Caucasus - from the height/altitude of 700 m is observed the formation of considerably

exceed 20-30% of cases for the autumn, in the seaside ones - it reaches to 25-40%. In the mountain areas, and in particular in the high-mountain ones, the decrease of their frequency occurs due to an increase in the frequency of the emergence of weathers with the transition of the temperature of air through 0° and the weathers of frost group. The frequency of the latter in the high-mountain areas is from 3- 5% in the beginning to 45-50% at the end of the autumn.

Characteristic feature of this period - increase of role of advective factor in formation of weathers both in low ones and in mountain areas.

In winter under conditions of Azerbaijan considerable probability of formation of frostless weathers is observed, which is caused by both the relatively high values of radiation balance and by special features/peculiarities of circulation. Their frequency is here dissimilar and oscillates in the large limits. To a considerable degree these oscillations are caused by the amplitudes of heights/altitudes, and also by the presence of sea (Fig. 3).

In low areas frequency of frostless weathers decreases from east to west in proportion to removal/distance from curtailment of sea into depth of territory. In the same direction increases a number of days with weather, being characterized by the transition of

nonarid weather almost throughout entire territory. Both in the value of frequency and in the distribution on the months between the seaside and internal lowlands there are considerable differences. Thus, in the seaside areas is observed a considerable increase of the frequency of this weather in the beginning of autumn and its gradual decrease toward the end of the season. However, in the internal lowlands the maximum of the frequency of light cloud nonarid weathers falls on October. In the high-mountain areas in autumn in comparison with the summer period their frequency increases insignificantly - by 5-10%.

In seaside and inner lowland areas is observed certain increase in frequency of weather of IV and V classes, predominantly without precipitation. In the mountain and high-mountain areas, on the contrary, they are more rare. The latter is connected, first of all, with weakening of convective processes in the mountain areas. In the low and partially foothill areas a considerable increase in the frequency of the overcast and rainy weathers is observed: whereas in the mountains their frequency in comparison with the summer period somewhat decreases.

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In the internal lowlands the frequency of these weathers does not

areas and small water objects (river, lake, reservoir, etc.), which increase the moisture content of air. The frequency of this weather in the coastal zone and on the islands is nonuniform: most frequently it is observed on the islands (Zhiloy - 24%, Artem - 17%) and in the coastal zone of Lenkoran' lowland (about 15%); in the remaining parts of the coastal zone its frequency does not exceed 10%.

Number of days with arid weather in Kura-Araksinskaya lowland in separate years varies from 0 to 100-110. We have comprised nomogram for calculating the probability of a number of days with the arid and dry-arid weather in the vegetal period in Kura-Araksinskaya lowland of different provisions (from 5 to 95%).

Autumn is characterized by increase of contrast of air masses arriving into Azerbaijan, in consequence of which increase in diversity of formed/shaped weathers occurs.

In first half of autumn value of radiation balance is still considerable (5.0-6.0 cal/cm^2), and almost throughout entire territory of Azerbaijan, including high-mountain areas, still are noted moderately arid, and by places and arid-arid weathers.

In comparison with summer period in autumn, especially into first half, appears tendency of increase in frequency of light cloud

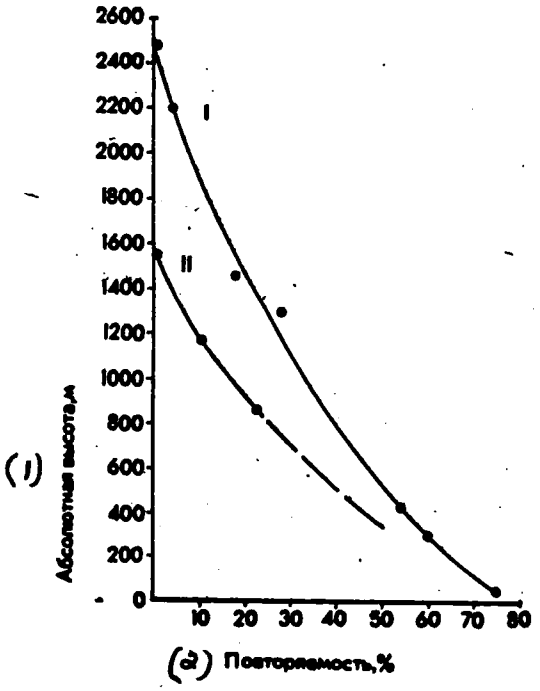

Fig. 2. Change in frequency of arid weathers on slopes without forest vegetation (I) and with forest vegetation (II), July, %.

Key: (1). Absolute height, m. (2). Frequency, %.

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This class of weather appears as a result of complicated interaction of the water surface of Caspian Region with low layers of air masses. Sometimes the humid-tropic weather can be observed, also, in the internal lowlands. The formation of this weather in these areas is connected with the effect of dense vegetation around the populated

In the low zone in the summer period they are formed/shaped rarely and, as a rule, they carry frontal character. Their frequency in the lowland does not exceed 5-6%, in the foothill areas - 18-25, but in mountain - 30-35%.

In summer period in contrast to low areas in mountains cloudy and rainy weathers receive development. Their general/common/total frequency during July reaches here to 20-45%.

In seaside areas of republic and on adjacent islands under conditions of simultaneous summer surplus of heat and moisture appears humid-tropic weather (Chubukov, 1953). On Apsheron and adjacent islands it is formed/shaped under the influence of the movable nuclei of azores high, on leaving of the southern cyclones or with the debris/efflux of the masses of tropical air (Madat-Zade, 1960). Conducted by A. D. Eyyubov investigations (1957) showed that about 25-30% of all cases of the formation of these weathers fall even to the initial stage of the intrusion of cold air masses.

(Zhiloy, Neftyanye Kamni arid-arid weather yes barely is observed. At a distance of 100-200 km from the sea on dry land their frequency during July reaches 50-60%. In proportion to approximation/approach to a sea this value decreases and in the seaside band (5-10 km) is reduced to 10-12%. In summer with movement of air mass from the direction of sea the effect of the latter is considerable only in a comparatively narrow band of coastal zone (about 20-25 km). In the direction of the motion of air mass seaward its effect disappears.

Moderately arid weathers are noted predominantly in summer period. Their frequency at the end of the spring and beginning of autumn is insignificant. They are spread considerably higher than arid-arid, and by places they are in summer observed even at the heights/altitudes of 2500-2600 m.

Frequency of light cloud nonarid weathers is insignificant not only in central low areas, but also in mountain ones, where convective processes, which lead to formation of daytime cloudiness, in summer intensely are developed. As a rule, these weathers in the mountains, being the consequence of the thermal and turbulence, which appears under the conditions of the strongly rugged relief, in 20-30% of cases are accompanied by precipitation, frequently the shower character with the thunderstorm.

frost ones is here 19 days (Krasnodar); to the east it decreases - from 13 - 14 days in the semideserts (Bashanta, Arzgir), also, on the north to 7-8 days in the steppes (located in the area of Kazan' - Veshenskaya). Therefore average monthly temperatures of air are reduced from -2° in the area of Krasnodar, to -4, in Arzgir and to -8.5° - - 8.8° in Kazan' - Veshenskaya. Stability, power/thickness and duration of snow cover also increase in essence northwards. Precipitation drops out little (12-30 mm). For the winter is characteristic predominance of cloudy weathers of different classes with the precipitation and without them, whose frequency during January oscillates from 17 to 22 days, in this case large relative humidity (84%-92%) is observed. In the separate years there are the duststorms.

To south from subprovince of steppe and semiarid climate subprovince of forest-steppe climate of Ciscaucasia is arranged/located. In its limits three climatic districts: western, it is well moistened, -2 Is. z.; central, sufficiently moistened, 2 Is. ts; eastern, it is moderate moistened, -2 Is. in. Under the conditions of moderately hot summer here predominate sunny weathers (19-20 days), among which rule light cloud nonarid (7-9 days) and moderately arid (8-10 days); arid- arid weathers here not each year (from 1 to 3 days).

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The average monthly temperature of air during July with the height/altitude is reduced from 23° to 21-20 (Stavropol'), and precipitation increase from 60 to 100 mm.

Winter the same unstable and cloud, as in subprovince of steppe and semiarid climate. but in central and eastern districts more frequently there are fog, ice-covered surfaces, rime. As a whole a climate in 1st and 2nd subprovinces is favorable for the cultivation of the large harvests of granular and industrial crops, grapes, fruits and vegetables.

On health resorts of Rostovskaya province, Krasnodar and Stavropol edges (Goryachiy Klyuch, Pyatigorsk, Zheleznovodsk, etc.) to successful treatment of diseases of nervous system, gastrointestinal, cardiovascular and others contributes climatotherapy - dosed solar and air baths and jaunts on nature walks. Weather conditions, especially in summer, are favorable for the tourist expeditions and the excursions.

With design of dwellings, health resort, school and other buildings in steppes and semideserts of Ciscaucasia should be considered need for sun-protecting devices/equipment (wood covering

detachment for first three stages/floors, and above special devices/equipment) and devices/equipment on air conditioning. Is desirable the southern orientation of buildings, which ensures the greatest illumination of locations in winter, when cloudy weathers predominate.

In subprovince of low- and of middle upland forest-steppe and forest climate (with height/altitude of up to 2000 m) are isolated five climatic districts. On the southwestern Black Sea slope of the large Caucasus two districts - Sochi-Tuapsinskiy, remoistened, with the maximum of precipitation by winter, 3 o. st, and Anapo-Tuapsinskiy, with the insufficient moistening in the west and sufficient in the east, with the winter maximum of precipitation, -3 o. A-T.

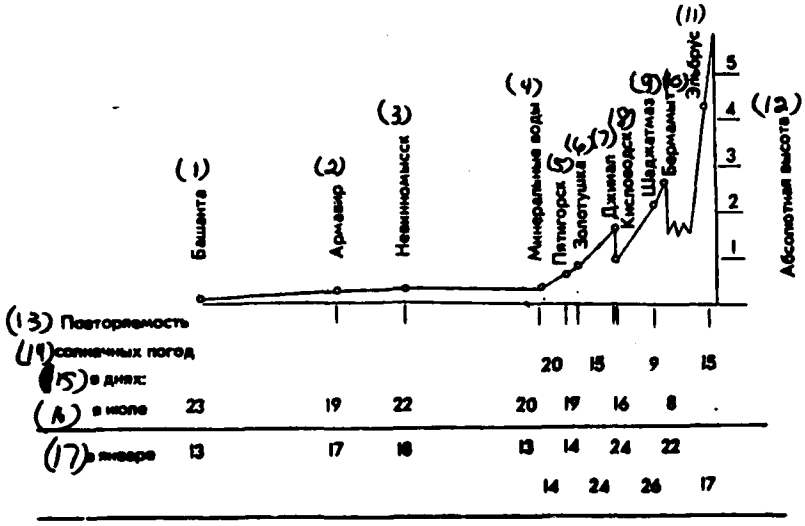

Fig. 1. Frequency of sunny weathers along profile of Bashanta - El'brus during July and January (in days).

Key: (1). Bashanta. (2). Armavir. (3). Nevinnomyssk. (4). Mineral waters. (5). Pyatigorsk. (6). Zolotushka. (7). Dzhinal. (8). Kislovodsk. (9). Shadzhatmaz. (10). Bermamyt. (11). El'brus. (12). True altitude. (13). Frequency. (14). sunny weathers. (15). in days: (16). during July. (17). during January.

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On the northern slope of the large Caucasus eastwards the decrease of precipitation and degree of humidification is observed. Are here isolated three climatic districts: western, well moistened, with the

winter maximum of precipitation, -3 Is. z.; central (between the meridians of El'brus and kazbek), sufficiently moistened, with the winter minimum and the summer maximum of precipitation, -3 Is. ts and eastern, moderately moistened, -3 Is. in.

In summer in this subprovince change of weather-climatic conditions with height/altitude is well expressed. Thus, during July in the central climatic district (3 Is. ts.) the average monthly temperature of air is reduced from 21.7°-20.4° at the height/altitude of 500-650 m (Pyatigorsk - Yesentuki) to 19°-15.5° at the height/altitude of 900-1300 m (Kislovodsk, the health resort Karmadon) and even to 11° at the height/altitude of 2000 m on the rocky ridge/spine (Shadzhatmaz). The frequency of the cloudy weathers of all classes with the precipitation and without them increases from 11 days in Pyatigorsk to 15 in Kislovodsk and to 19-20 days in Шаджатмаза area. In connection with this increases the amount of precipitation - from 70 to 90-120 mm. With the height/altitude the character of weather is changed. In the belt/zone of wooded plain, approximately/exemplarily at the level 600-700 m, disappear aridly arid weathers; above 1500-1600 m in the belt/zone of the mixed and coniferous forests/scaffolding and humid mountain meadows do not appear moderately arid weathers. At the same time increases the frequency of light cloud nonarid weathers (Nagaytsev, 1963). In the mountain areas of Central Asia, which border on the desert, the limit

of the propagation of arid-arid weathers is located considerably above - approximately/exemplarily on 1000-1200 m, and moderately arid - about 2000 m (Chibouks, 1957). As is evident, the limit of the propagation of arid weathers in the mountains of the northern slope of the large Caucasus is located lower than in mountains of Central Asia. This is explained by the more western positions of the large Caucasus (in the zone of steppes and semisteppes, greater by frequency in its territory of cyclones and their fronts.

It is necessary to note that with increase in locality/terrain gradual transition of weathers of all classes to fresher types is observed.

Winter in low-mountain zone (to 1000 m) of northern slope of large Caucasus the same as in plains of Ciscauscia, -unstable, cloud, damp/raw. In the middle upland zone the winter is also unstable, but usually is solar and is dry. Thus, during January in the central climatic district the frequency of weathers with the transition of the temperature of air through 0° and frostless decreases from 20 days at the height/altitude of 1000 m (Kislovodsk) to 15 at the height/altitude of 2000 m (Shadzhatmaz), and solar respectively is increased from 23-24 days to 26 (Fig. 1 and 2).

Supremacy of sunny weathers in middle upland belt/zone is in winter observed on northern slope of large Caucasus in section, limited in west and east by height/altitude about 2000-2500 m. It is explained by the presence here of that frequently appearing and prolongedly being preservable in the altitude limits of the low-mountain belt/zone of the layer of inversion or isothermy. Its formation/education is connected with the general-circulation conditions, with the supremacy in the middle troposphere of western air-mass transfer, with the foehn effect, and also with the foci of intense cooling. So, during the cloud cloudy day during December or January, following in the bus on the highway from the region of the plains of Ciscaucasia on the mountain valleys of the rivers Gizel'dona, Fiagdona, Ardona, Podkumka and others, can be observed, as at the specific height (from 700 to 1000 m) machine passes through the cloud layer, higher than which the large Caucasus mountains are poured by sunlight and above them dark-blue azure, usually cloudless sky spreads.

From Ordzhonikidze or Alagir, covered during December and January with weeks by low cloudiness, on bus in 3 hours it is possible to rise on valley of Ardona into Zgid settlement, arranged/located on southern slope of rocky ridge/spine (1700-2300

m). The bewitching view of the ridges of the large Caucasus, covered with glaciers and snow hence is opened/disclosed, which clearly are drawn against the background of dark-blue azure sky. From the rocky ridge/spine they are isolated by the here deeply cut into U-shaped valley, on which is laid the road into Zgid. To the tourists, the health resort visitors, the excursionists, who for the first time accomplish the journey from Ordzhonikidze to the mountains, this contrast exchange of weathers in 3 hours produces indelible impression.

In western climatic district of low- and of middle upland forest-steppe and forest climate (3 Is. z.) is arranged/located series/row of mountain valleys, which have national-economic value and being known areas of health resort treatment and tourism (valley of Kubans, Teberdy, Dombaya, river of white, etc.). In summer here on corresponding heights/altitudes is observed a larger quantity of sunny weathers, than in the central district. Their increased sunshine is connected with the foehn effect. The winter in these valleys is unstable, is solar, with the large amount of precipitation. Therefore considerable snow cover here is formed and are possible ski jaunts, sport agings/trainings and competitions. Snow avalanches are terrible here.

Subprovinces of low- and of middle upland forest-steppe and

forest climate on its natural climatic conditions - best area for health resort treatment, rest and tourism. In winter here in the conditions of sunny weather the temperature of air in the daytime reaches 8-14, and radiation frost at night is observed. Relative humidity in the daytime is reduced to 40-60%. Average monthly relative humidity during January is reduced to 70% at the height/altitude of 900-1000 m (Kislovodsk) and to 60% at the height/altitude of 2000 m (Shadzhatmaz).

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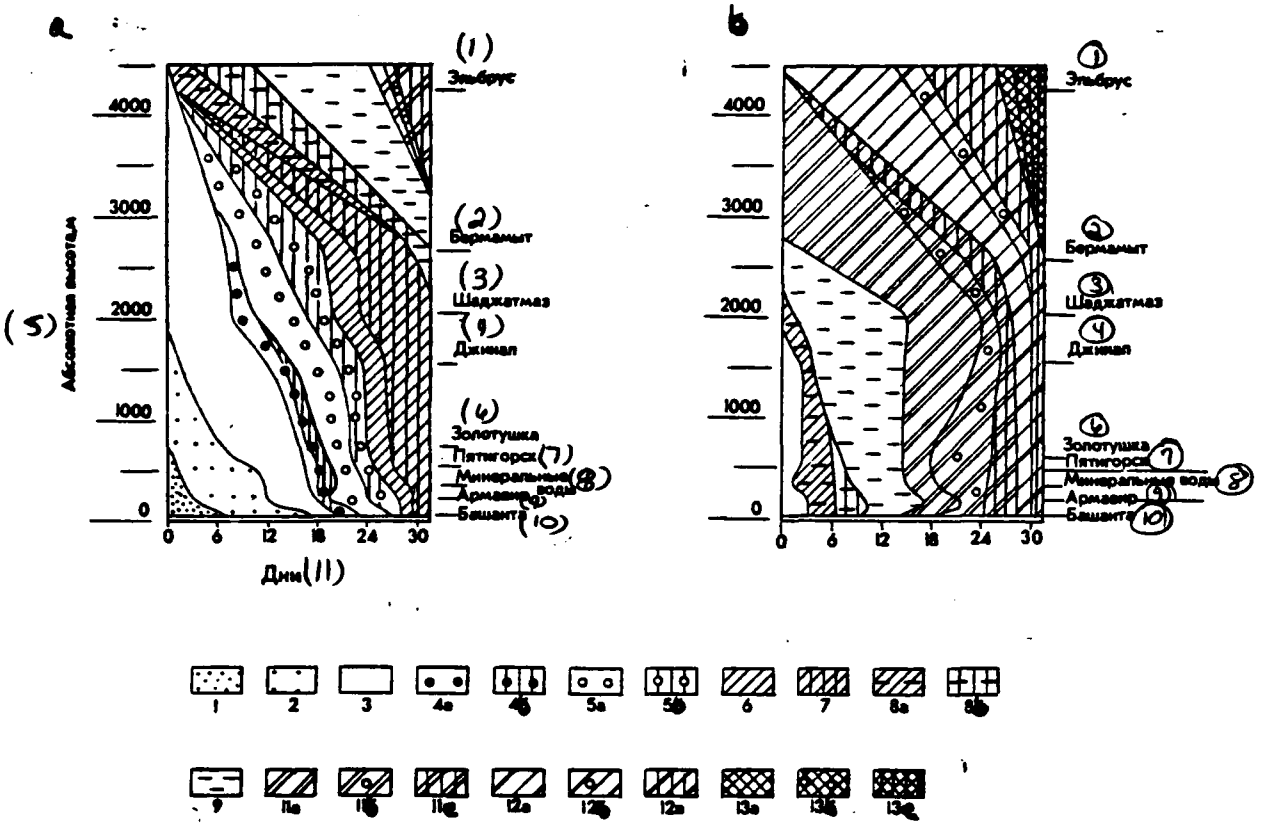

Key: (1). El'brus. (2). Bermamyt. (3). Shadzhatmaz. (4). Dzhinal. (5). True altitude, m. (6). Zolotushka. (7). Pyatigorsk. (8). Mineral. (9). Armavir. (10). Bashanta. (11). Days.

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Under the conditions of the cool and sufficiently cloud summer and of the unstable winters of building, projected/designed for this

subprovince, must have the large window apertures, which increase the illumination of rooms, and the increased strength of the roofing of roofs, calculated for the strong showers, frequently accompanied by hail.

In province of high-mountain climate of middle latitudes from 2000 m and it is above allotted to three climatic subprovinces: 4 - lower - subprovince of climate of coniferous forests/scaffolding and subalpine meadows with moderately warm summer (average monthly temperature of air during July from 13 to 9°) and solar winter, unstable in lower forest belt/zone and by weakly unstable in upper subalpine belt/zone; 5 - average/mean - subprovince of climate of Alpine meadows with fresh summer (average monthly temperature of air during July from 9 to 2°), with weakly unstable winter in lower belt/zone and stable, moderately frozen in upper, where frequency of moderately frost weathers during January reaches 18 - 22 days; 6 - upper-province of a climate of perpetual ice and snow with average monthly temperatures of air during July from 2 to - 10° and with the stable, considerably frost winter (recurrence of considerably frost weathers from 20 to 25 days).

On west of province region of greatest precipitation is found. Thus, in the area of mountain Achishkho (2000-2200 m) drops out the largest in the USSR annual amount of precipitation - 3682 mm. Their

maximum is observed during December - 483 mm and during January - 468 mm. Amount of precipitation and degree of humidification in subprovince decrease eastwards, and the severity of winter increases. Each subprovince is subdivided into the climatic districts.

High-mountain province - most important area of pasture cattle breeding on Alpine and subalpine meadows, tourism and mountain climbing. In 1970 on the southern slope of El'brus the USSR'S first high-mountain passenger pendulum aerial ropeway is constructed. In its cars from Terskola (2100 m) in 20-30 minutes it is possible to rise to El'brus glaciers (3700- 4000 m), where weathers with the transition of the temperature of air through 0° even in summer rule. In several kilometers from Terskola in the valley of the river Baksana seat cable telpher works; sitting in the seat, in 15-30 minutes tourists, mountain climbers, excursionists they are risen along the slope of mountain Cheget to height/altitude 2750 and 3050 m, with which is opened/disclosed amazing panorama to El'brus, beam, main Caucasian ridge/spine, covered by those glittering under the sun rays to ices and the snow, to gorges and gorges of Baksana.

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Thorough study of local weather and climate, and also climatic resources/lifetimes of Ciscaucasia and large Caucasus mountains will

make it possible to better utilize them for national economy, during organization of health resorts, tourist bases and boarding houses for rest.

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BIOCLIMATIC EVALUATION OF THE BLACK SEA COAST FOR PURPOSES OF REST.

N. A. Danilova.

During the complex recreational evaluation of territory it is very important to determine the action of climatic conditions on the man, since on them the character/nature of the biochemical processes taking place in the organism depends, which positively or negatively affects health and must be considered in the industry of rest.

Questions of effect of meteorological conditions on man can be permitted successfully by joint efforts/forces of physicians and climatologists, about which A. I. Voyeykov (1884) wrote already. This is explained by great variety, multifactoredness and complexity of interrelations and reactions, which are observed under the influence of the environment on the physiological processes in the human organism.

Explanation of effect of air medium by evaluation of

Taking into account demands of tourists and resting for thermal and other modes of environment under conditions of the Black Sea, when man conducts large part of time of day in warm season in open air, maximally utilizing sea, we secreted weather types, evaluated as favorable.

For Moscow area this weather is not typical, it is formed/shaped rarely, into the separate years. Under some microclimatic conditions, which facilitate heating the earth's surface, for example, on the southern slopes of Caucasus and Crimean mountains in the removal/distance from the coast, are created the conditions (in Golubinka, for example), when this weather type is observed more frequently - 11% (to 40 days).

To one physiological evaluation of weather employing procedure of Ye. M. Ratner for recreational targets cannot be been limited. The suitability of weather conditions for tourism and rest is necessary to estimate also from the positions of the separate elements/cells, which characterize the frequency of the occurence of the unfavorable for the man weather phenomena (precipitates in the form of rain and snow, that go more than one hour, winds with the speed of the larger 5-6 m/s and rainy weather, when high wind is combined with the precipitation for the hour and more).

Deducting of duration each of isolated weather type quantity of days with enumerated unfavorable weather phenomena, we will obtain duration of "good" weather in each of its phyla/types.

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Table 2. Comparison of thermal conditions into 1962 and 1964 with the average/mean lasting ones.

(1) Станция	(2) Год	(3) Температура и разность, °С	(4) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	(5) Средне-годовая температура	(6) Число дней с морозами
(7) Одесса	1964	t°	−5,2	−2,9	−0,2	8,2	13,0	21,4	22,1	19,8	16,8	12,3	5,7	4,1	9,6	100
		$t^\circ_{ср.\,мн.}$	−3,0	−2,3	2,0	8,5	15,3	19,6	22,5	21,4	16,6	10,7	4,5	−0,4	9,6	
	1962		0,7	−1,4	2,0	10,6	16,0	19,4	20,9	22,7	16,2	10,9	8,0	−0,6	10,4	96
		$\Delta_1 = t^\circ_{ср.\,мн.} - t^\circ_{64}$	+2,2	+0,6	+2,2	+0,3	+2,3	−1,8	+0,4	+1,6	−0,2	−1,6	−1,2	−4,5	0,0	
		$\Delta_2 = t^\circ_{ср.\,мн.} - t^\circ_{62}$	−3,7	−0,9	0,0	−2,1	−0,7	+0,2	+1,6	−1,3	+0,4	−0,2	−3,5	+0,2	−0,8	
(8) Ялта	1964	t°	1,1	3,3	5,2	10,8	13,1	22,6	23,6	21,6	19,3	14,7	8,8	7,6	12,6	34
		$t^\circ_{ср.\,мн.}$	4,0	3,8	5,9	10,3	15,6	20,3	23,7	23,5	19,1	14,2	9,3	6,1	13,0	
	1962		5,7	4,9	8,2	12,2	16,3	20,9	23,3	24,5	19,4	15,2	12,6	7,2	14,2	9
		$\Delta_1 = t^\circ_{ср.\,мн.} - t^\circ_{64}$	+2,9	+0,5	+0,7	−0,5	+2,4	−2,3	+0,1	+1,9	−0,2	−0,5	+0,5	−1,5	+0,4	
		$\Delta_2 = t^\circ_{ср.\,мн.} - t^\circ_{62}$	−1,7	−1,1	−2,3	−1,9	−0,7	−0,6	+0,4	−1,0	−0,3	−1,0	−3,3	−1,1	−1,2	
(9) Сочи	1964	t°	1,3	5,9	8,2	11,4	14,1	21,7	22,2	20,6	19,2	14,2	10,6	8,9	13,2	25
		$t^\circ_{ср.\,мн.}$	5,8	5,9	8,1	11,6	16,1	19,9	22,8	23,2	19,9	15,9	11,6	8,2	14,1	
	1962		7,0	7,2	10,9	12,3	16,5	20,1	23,7	23,6	23,0	15,9	14,4	10,2	15,2	5
		$\Delta_1 = t^\circ_{ср.\,мн.} - t^\circ_{64}$	+4,5	0,0	−0,1	+0,2	+2,0	−1,8	+0,6	+2,6	+0,7	+1,7	+1,0	−0,7	+0,9	
		$\Delta_2 = t^\circ_{ср.\,мн.} - t^\circ_{62}$	−1,2	−1,3	−2,1	−0,7	−0,4	−0,2	−0,9	−0,4	−3,1	0,0	−2,8	−2,0	−1,1	
(10) Батуми	1964	t°	2,8	6,0	8,3	11,6	14,4	22,0	22,6	21,5	19,4	14,6	12,4	9,5	13,8	20
		$t^\circ_{ср.\,мн.}$	7,1	7,2	8,4	11,5	15,8	20,0	22,8	23,2	20,3	16,6	12,0	8,6	14,5	
	1962		7,8	7,9	11,8	12,0	17,2	20,7	23,4	24,0	19,9	16,2	14,4	12,4	15,6	2
		$\Delta_1 = t^\circ_{ср.\,мн.} - t^\circ_{64}$	+4,3	+1,2	+0,1	−0,1	+1,4	−2,0	+0,2	+1,7	+0,9	+2,0	−0,4	−0,9	+0,7	
		$\Delta_2 = t^\circ_{ср.\,мн.} - t^\circ_{62}$	−0,7	−0,7	−3,4	−0,5	−1,4	−0,7	−0,6	−0,8	+0,4	+0,4	−2,2	−3,8	−1,1	

Note: t°_{64} - average/mean monthly temperature of the given month in 1964, t°_{62} - in 1962, $t^\circ_{ср.\,мн.}$ - average/mean lasting temperature.

Key: (1). Stations. (2). Year. (3). Temperature and difference, °C. (4). Months. (5). Average annual temperature. (6). Number of days with frost. (7). Odessa. (8). Yalta. (9). Sochi. (10). Batumi.

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summer heat of sea (breezes) it is encountered more rarely, especially in the scythes, the peninsulas, where the effect of sea is strong (Tendrovskiy beacon, Khersonesskiy beacon).

of the Black Sea is suitable for the recreational targets in winter and spring time. It is interesting to note that, according to calculations by L. M. Rat'kova, Ye. D. Smirnova, I. P. Chala (1970), which relates the same year for Moscow region, weather of this phylum/type in the middle strip of union is held during 24-84 days.

Most frequently encountered weather type in the Black Sea 1 X; in south, in area of Batumi, to it is required 135 days, in area of Odessa coast - 206 days. In Moscow area the weather of this phylum/type is held still longer - from 234 to 285 days in the year.

Comfortable weathers of phylum/type N comprise on northwest of the Black Sea 25% days of year (about three months); they much more frequently are encountered on southern shore of Crimea and in southern areas of Caucasian coast - 35-36% of days (i.e. 4.5 months); in Moscow region - 8-18% (29-65 days).

To warm weathers of phylum/type 1т falls from one to two months in Odessa coast and to 4.5 months in subtropics.

Hot, unfavorable for recreational targets weather of phylum/type 2т (the more 3т) most frequently is observed in steppe (Kherson, Yevpatoriya, Abrau-Dyurso) area (6-7%, or 21-25 days). In the coasts, fenced off by mountains, under the effect/action of cooling the

Table 1. Comparison of thermal conditions in 1962 with the average/mean lasting ones.

(1) Станция	(2) Разности температур, °С	(3) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	(4) За год
Одесса (5)	$t°_{62} - t°_{ср.мн.}$	+3,7	+0,9	0,0	+2,1	+0,7	−0,2	−1,6	+1,3	−0,4	+0,2	+3,8	−0,2	+0,8
Ялта (6)	$t°_{62} - t°_{ср.мн.}$	+1,7	+1,1	+2,3	+1,9	+0,7	+0,6	−0,4	+1,0	+0,3	+1,0	+3,3	+1,1	+1,2
Сочи (7)	$t°_{62} - t°_{ср.мн.}$	+1,2	+1,3	+2,1	+0,7	+0,4	+0,2	0,0	+0,4	+3,1	+0,0	+2,8	+2,0	+1,1
Батуми (8)	$t°_{62} - t°_{ср.мн.}$	+0,7	+0,7	+3,4	+0,5	+1,4	+0,7	+0,6	+0,8	−0,4	−0,4	+2,2	+3,8	+1,1

Note: $t°_{62}$ - the average/mean monthly temperature of the given month in 1962 $t°_{ср.мн.}$ - average/mean lasting temperature in the given month.

Key: (1). Stations. (2). difference in temperatures, °C. (3). Months. (4). In year. (5). Odessa. (6). Yalta. (7). Sochi. (8). Batumi.

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Coldest weather (of phylum/type 2x) in Caucasian coast is not encountered from Genendzhik to Batumi, but in Crimea - from Alushta in the east to Foros in west; it appears on slopes (Golubinka, 219 m above sea level), also, in hollows, removed from coast (Orlinoye, 270 m above sea level). In the part of the coast with Mediterranean phylum/type of climate in the winter months and even in the beginning of spring (March) it is observed during 15 days, and in the northwestern coast, where the warming up effect of sea is reduced, to 20-24 days. Consequently, this latter/last area of other less parts

Their distribution along territory as a whole confirms accepted in climatology division of the Black Sea into: 1) moist subtropics (from batumi to section of coast between Sochi and Tuapse); 2) comparatively dry coast with Mediterranean climate, in which winter precipitates predominate, where enters northwestern part of Caucasian coast and eastern part of Crimea to Alushta, and also eastern steppe part of Crimea; 3) dry subtropics - southern shore of Crimea (from cape Foros to Alushta); 4) coast of South Ukraine with colder winter, on climatic conditions more more similar to remaining part of steppe zone YeTS.

3).

In calculations daily actinometric data are used according to total radiation on five stations 12 hours 30 min. (Odessa, Yalta-Nikit botanical garden, Kara-Dag, Sochi, Sukhumi). Radiation conditions on the remaining selected by us stations are obtained by interpolation method taking into account cloudiness.

During determination of weather types in each day in 1962 for 27 stations were comprised and evaluated 9755 cards of weather. The data about the wind, which at the stations is observed at the height/altitude of weathervane, which varies from 16 to 10 m, were cited to the height/altitude of 2 m according to V. K. Petrov's method (1958).

In Black Sea coast, which is located under great effect of water mass of Black Sea, in some parts because of mountain ridges of Caucasian and Crimean mountains climatic conditions are created specific nonzonal and very favorable for rest and tourism.

All encountering here for period of year of weather relate to six phyla/types: to one comfortable - N, to two cold - 1x and 2x and to three warm: 1т, 2т, 3т.

(in those weakened and patients of requirement for the weather others).

For recreational targets is important evaluation of concrete ones weather conditions, with which it is necessary to be encountered resting and to tourist. In this case should be given the characteristics of daily weather in the separate years, but not put to use average/mean lasting data, and to show the possible limits of the mutability/variability of weather conditions (Alisov, Myachkova, Sorokin, 1971).

Bioclimatic evaluation of Black Sea coast is made according to weather data of 1962 and 1964. The comparison of the thermal conditions of the selected years with the average/mean lasting ones is given in Tables 1, 2.

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Laying out of weather to phyla/types was conducted by us in daily values of temperature, air humidity, wind velocity, value of total radiation. For this are used daily weather data (to 13 hours) on 27 stations of the Black Sea, which are found under varied conditions of relief, on the different true altitudes, on the shore of sea and in the distance from it (see the list of stations, Table

other geographical area, it appears also in connection with different reaction to weather conditions in aborigines and those, who arrived here from different parts of Soviet Union - from middle strip, from northwest, from Siberia and from extreme north. In all these people the acclimatization passes differently, and their reaction to the weather conditions is dissimilar. For example, comfortable state in the inhabitants of Baltic States appears with EET of 12°, and in the tunics of the Black Sea and other southern parts of the country - at 17.3-21.7° (numeral they are given for the bare person).

Are dissimilar requirements for weather conditions and in persons of different age, different degree of hardness, different health status.

Bioclimatic evaluation of Black Sea coast is given employing procedure of E. M. Ratner (1967), into which are introduced some supplements, connected with specific character of evaluations for recreational targets. The characteristic of climatic conditions is based on the frequency of the recurrence of specific weather types, which call one or the other thermal condition of man. In this case it is thought that resting or the tourist is dressed with respect to season and concrete weather data of day and is occupied with moderate/mild work, for example it goes with the knapsack, are placed tent, etc. All calculations relate to the healthy/sound young person

over wide limits depending on physiological, age, acclimatizing special features/peculiarities, on the health status, social, household and other factors.

Theoretical approaches to physiological evaluation of climatic conditions were given by I. S. Kandror (1966, 1969); then works in this direction were continued for it together with D. M. Demina, G. I. Murav'yeva, M. N. Yevlampiyeva, Ye. M. Ratner (1967).

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Searches of objective evaluation of thermal condition of man led to the fact that temperature of skin of man proved to be best criterion in this respect.

Developing further these works Ye. M. Ratner (1967) during evaluation of effect of climate on thermal condition of man took as basis weighted mean temperature of skin. It turned out that the comfortable state appears when the weighted average temperature of skin is 31-33°. Reduction/descent or its increase leads to the different degree of the stress/voltage of the heat regulator mechanisms of organism.

Complexity of bioclimatic evaluation of Black Sea coast, as any

degree of the stress/voltage of the heat regulator mechanisms of organism appears.

Putting to use calculated heat-balance method, in Main Geophysical Observatory (Budyko, 1960; Yefimova and Tsitsenko, 1966) were constructed for USSR maps/charts/cards of comfort zones for summer half year, necessary heat-insulating properties of clothing, etc.

V. I. Rusanov (1969) made medico-geographical maps/charts/cards for Western Siberia, and T. N. Liopo (1968) - map/chart/card of thermal condition of man for entire Siberia. For the mountain areas and the hot deserts of Central Asia the bioclimatic charts are comprised by B. A. Ayzenshtat (1969). Putting to use heat-balance method, it characterizes comfort and discomfort of the climatic conditions of this area with the value of the perspiration, by which man is protected from the excessive overheating in the desert in the summer time.

Heat-balance method must be used in complex with method checked by physiologists of objective evaluation of thermal condition of man, but not subjective evaluation of action of environment, expressed in concepts coldly, is fresh, heat, it is hot. The latter are very inaccurate and can be only auxiliary. They vary in different people

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The structure of the climate of many health resorts of the USSR and series/number of the foreign countries (for example, see BME, 2nd ed., 1962, the map/chart/card of the structures of climate) is studied by this method.

Procedure, which makes it possible to evaluate favorableness and unfavorableness for man of weather types, isolated on synoptic signs and specific quantitative combination of characteristics of meteorological elements, is proposed also by B. P. Alisov (1969). It and its pupils carried out climatic analysis for Baltic States, Moscow area, Yalta, Baku, Batumi and other areas of the USSR.

Recently considerable development obtained method of evaluation of effect of climatic conditions on man, who consists in calculation of value of heat balance of its body. The reaction of organism to the environment is examined from the point of view of the account of the thermal condition of man. For retaining/preserving/maintaining the isothermy of the internal parts of the body with a change in the ambient temperature the thermogenesis and the heat emission of organism changes; occurs this by changing in the gas exchange, blood circulation, perspiration and other functions, connected with the work of nerve centers. In the hot and cold weathers the different

effect/action of separate weather constituents long ago narrower is acknowledged insufficient. The searches for the more advanced methods led to the propagation abroad and the evaluations of the effect/action of climate on the man by determining EET - equivalent-effective temperatures and REET - radiation-equivalent-effective temperatures (considering the complex effect of temperature, wind and humidity, and REET - even the arrival of solar radiation) (But'yeva, 1969; Il'icheva, Shvareva, 1961; Milevskiy, 1960; Murav'yeva, 1969; Remizov, 1934).

There are methods of instrument/tool determination of effect/action of climate on man by instruments by frigorimeter and by catathermometer, also considering combined action of several meteorological and radiation elements/cells. They all are not deprived of the specific deficiencies/lacks in the tool house and the procedural nature.

In health resort science method of complex climatology, developed by E. Ye. Fedorov and L. A. Chubukov (1963), is accepted. By them it is possible to characterize the weather of days and the weather of moment/torque, to estimate the stability of the specific phylum/type and class of weather, and also the contrast of the replacements of weather.

Table 3. List of the stations of the Black Sea coast in accordance with the map/chart/card.

(a) № станции	(b) Станция	(c) Высота над уровнем моря, м	№ станции	Станция	Высота над уровнем моря, м
1	Одесса	64	15	Темрюк	3
2	Тендровский маяк	4	16	Красный Ляман	107
3	Херсон	13	17	Анапа	6
4	Евпатория	4	18	Абрау-Дюрсо	102
5	Херсонесский маяк	2	19	Геленджик	4
6	Орлиное	270	20	Джубга	23
7	Голубинка (Кок-козы)	219	21	Туапсе	41
8	Ялта (Ник. бот. сад)	208	22	Сочи	57
9	Алушта	4	23	Красная Поляна	566
10	Судак	6	24	Сухуми	116
11	Карадаг	42	25	Поти	3
12	Феодосия	26	26	Бахмаро	1 920
13	Керчь	1	27	Батуми	14
14	Тамань	5			

Key: (a). No of station. (b). Station. (c). Height/altitude above sea level, m. (1). Odessa. (2). Tendrovskiy beacon. (3). Kherson. (4). Yevpatoriya. (5). Khersonesskiy beacon. (6). Orlinoye. (7). Golubinka (Kokkozy). (8). Yalta (Nik. bot. garden). (9). Alushta. (10). Sudak. (11). Kara-Dag. (12). Theodosius. (13). Kerch'. (14). Taman'. (15). Temryuk. (16). Krasnyy Liman. (17). Anapa. (18). Abrau-Dyurso. (19). Gelendzhik. (20). Dzhubga. (21). Tuapse. (22). Sochi. (23) Krasnay Polyana (24). Sukhumi. (25). Poti. (26). Bakhmaro. (27). Batumi.

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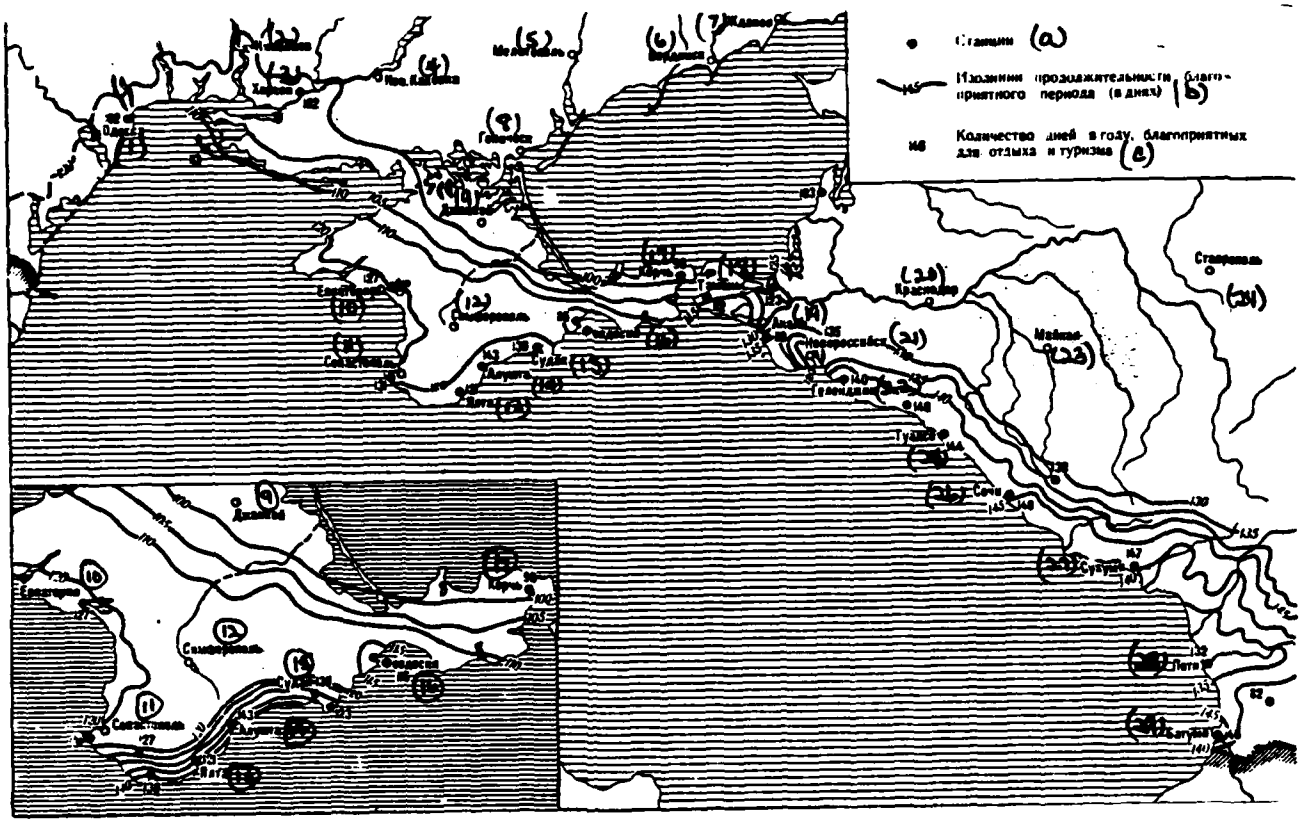

Map/chart/card of the duration of favorable period for tourism and rest in the Black Sea coast (in the year in the days).

Key: (a). Stations. (b). Isolines of duration of favorable period (in days). (c). Quantity of days in year, favorable for rest and tourism. (1). Odessa. (2). Nikolayev. (3). Kherson. (4). Novaya Kakhovka. (5). Melitopol'. (6). Berdyansk. (7). Zhdanov. (8). Genichesk. (9). Dzhankoy. (10). Yevpatoriya. (11). Sevastopol. (12). Simferopol'.

(3). Yalta. (14). Alushta. (15). Sudak. (16). Theodosius. (17). Kerch'. (18). Taman'. (19). Anapa. (20). Krasnodar. (21). Novorossisk. (22). Gelendzhik. (23). Maykop. (24). Stavropol'. (25). Tuapse. (26). Sochi. (27). Sukhumi. (28). Poti. (29). Batumi.

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To them were related N and 1т with the deduction of the unfavorable rainy, snow or windy and rainy weathers indicated. In the frequency of their occurence in the different areas of the Black Sea coast the accompanying map/chart/card of the duration of period favorable for the recreational targets is constructed.

As of it appears, longest favorable period - 147-140 days (38.4-40.3%) of year, i.e., 5-4.5 months, it is observed from southern borders of Soviet Union in area of Batumi to Geneldzhik inclusively, also, on southern shore of Crimea. It is shortened in the Rion lowland. On the slopes of the specific exposure and slope/transconductance, that border this lowland, it is extended in connection with strengthening of heating by straight/direct solar rays/beams, because of the foehn and inversion phenomena.

Effect of true altitude above sea level we can evaluate only approximately, since we have available material along small quantity

of stations, which are found on different heights/altitudes, even then in various forms of relief. During the evaluation it is necessary to have in mind that for Caucasus the gradient of the decrease of temperature is accepted (according to G. T. Selyaninov, 1961) - 0.5°, and for Crimea - 0.67° (according to I. I. Babkov, 1966).

Difficulty of evaluation of climatic conditions in mountains consists in mosaic structure of distribution of temperatures, wind, insolation in dependence on slope/transconductance, concavity and convexity of forms of relief, closed nature of horizon/level on different rhumbs/bearings, etc. Thus, health resort Bakhmaro, arranged/located on the height/altitude 1920 m on the western slope of the Adzharo-Imeretinskyy spine in the zone of coniferous forests/scaffolding and Alpine meadows, has crucible-marine climate with the soft winter n by warm summer. Favorable for tourism and rest of weather, according to the carried out by us classification, are held here in the course of 2.5 months. The not without reason local house of rest functions approximately from 15 June through 10 September. Arranged/located below, at the height/altitude of 570 m, in the Mzymtha valley , health resort red clearing (in 52 km to the north from Adler) in the duration of favorable season barely differs from the health resorts of coastal area, has crucible-marine climate and it is very popular in tourists.

Favorable for recreational targets weather types in Caucasian subtropics occur the year round.

On southern shore of Crimea these weather types are observed from April (half of days of month), and from May through their October somewhat more. In summer the weather, favorable for rest and tourism, it predominates during all days of months. Thus, in Gelendzhik to the weather of other phyla/types in three summer months fall only 2 days, in the Batumi - 4 days, in Alushta - 7 days.

Too hot a weather, which calls strong load of heat regulator mechanisms of organism (phyla/types 2т and 3т), is encountered in summer ones, and sometimes also in autumnal months in Golubinka, in Crimea (far from coast), such weathers were during 17-14 days, in Kherson - 12, in Sochi - 12, in Theodosius and Gelendzhik - 10, and in remaining points of the Black Sea - 1-6 days.

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At heights/altitudes more than 1000 m it is not encountered almost entirely. The comparison of the duration of favorable for rest and tourism of period in 1962 with the same in 1964 it is given in

Table 4.

During recreational evaluation of areas of moist subtropics of Western Transcaucasia it is necessary to consider adverse effect of stuffy humid-tropical weather. It appears here at high summer temperatures (more frequent with the maximum ones - 26-30° and minimum - 18-23°), when relative humidity exceeds 80%. Most frequently such stuffy weathers appear with the calm circumstances, especially into second half of summer - during August. In the swampy lowland in Supsy r. area they predominate in 50% of summer days (Chubukov, 1963). Humid-tropical weather is observed both with the rains and in the rainless weather with different degree of overcast. According to R. P. Kavkasidze and G. A. Ushveridze, in Gagry area 13 hours during July and August it is encountered almost each day.

As is known, high temperatures better are transferred with lowered/reduced air humidity. So, at a temperature of 23.2° and relative air humidity 20% heat-sensation are the same as with 18.9° and humidity 80%, since with an increase in the air humidity hinders perspiration and is disturbed the thermostatic control of organism.

In our further work should be refined procedure of account of quantity and propagation of stuffy weathers and excluded they from duration of favorable period in areas, where they are especially

frequent. As the possible reception/procedure of the evaluation of such weathers it is possible to refer to the method, proposed by N. N. Akimovich and O. A. Ballal (1970).

Table 4. Duration of favorable for rest period with weather types N and 1 t (without the unfavorable meteorological phenomena: prolonged rains, high winds and rainy weather).

(1) Станция	(2) Годы		(3) Разница в продолжительности благоприятного периода между 1962 и 1964 г.
	1962	1964	
(4) Одесса	102	106	—4
(5) Херсон	102	103	—1
(6) Евпатория	127	106	+21
(7) Ялта	121	107	+14
(8) Карадаг	123	113	+10
(9) Геленджик	140	114	+26
(10) Сочи	140	119	+21
(11) Сухуми	147	133	+14
(12) Батуми	146	120	+26

Key: (1). Station. (2). Years. (3). Difference in duration of favorable period between 1962 and 1964. (4). Odessa. (5). Kherson. (6). Yevpatoriya. (7). Yalta. (8). Kara-Dag. (9). Gelendzhik. (10). Sochi. (11). Sukhumi. (12). Batumi.

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In developments of K. A. Murav'yeva (1969), who uses method of EET, are given numerals, which characterize increase in quantity of days with favorable weather in summer time with increase in altitude above sea level in Western Transcaucasia. With her conclusion about the need of expanding the recreational zone of Caucasus in the mountains it is possible completely to agree. Such measures will make it possible to decrease the overpopulation of coast of Black sea in

summer months.

Under conditions of populated areas of men it undergoes radiation exposure of walls of buildings, samplings, asphalted streets, green cultivations, while under natural conditions - mountain slopes, sea, vegetation, etc. These inosculating effects are very complex and change in the dependence on the forms of relief, exposure of slopes, mutual arrangement and distance of man from them, and also from the time of the day and year. For the recreational targets it is necessary to evaluate them, being based on the method developed by B. A. Ayzenshtat (1965).

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CLIMATE OF THE MIDDLE UPLAND BELT OF THE CARPATHIANS IN WEATHERS.

The studies of the climatic and weather special features/peculiarities of the middle upland areas of the Ukrainian Carpathians, the conducted by sector geographies of AS UkSSR, UkrNIGMI [УкрНИГМИ - Ukrainian Scientific Research Hyrometeorological Institute] and by the Universities of L'vov, Chernovits and Uzhgorod in the weakly-illuminated in meteorological sense areas at the heights/altitudes of more than 1000 m above sea level, are important in many respects. Special importance in the development of the feed base of mining/mountain-pasture stock raising has a study of weather special features/peculiarities of the subalpine zone, where are arranged/located meadows-plains - most important feed land and reserve for further development of local stock raising. The same areas are of interest, also, from a tourist point of view.

Materials of weather station Pozhizhevskaya, located in this zone on height/altitude of 1430 m above sea level, give possibility to preliminarily evaluate climatic and weather special features/peculiarities of mountain areas important in economic sense. Utilizing a complex method of climatological analysis during

processing of daily weather data in 8 years (1959-1967), we composed the climatological table of the recurrence of the classes of weathers, which were being observed in this terrain.

Analysis of this table makes it possible to reveal/detect some laws in mode/conditions of local weather into separate seasons of year.

For July and August characteristically complete absence of frost weathers and weathers with transition of average/mean daily temperature of air through 0°; minimum temperature of air never was omitted below 0°, but maximum reached highest values - 27°.

Maximum recurrence of weathers of VII class - 30-34%, IV class - 35-37% at average/mean monthly temperature of air for July of 12.0° and August 11.7° makes it possible to define them as typically summer months.

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Formation of typically summer ones - hot and dry weathers (II class) possibly also during June and September (with the same recurrence, as for August, 2%). The frequent onset in the daytime of cloud ones (IV class) - 44% - during June and light cloud (III class)

- 28% - during September - they give grounds to relate both these months also to the summer ones. The small percentage of the recurrence of weathers with the transition of the temperature through 0° together with the precipitation in the form of the snow (not yearly) and with a decrease in minimum temperatures to the negative values (to -5°, -6° in the separate years) characterizes June and September as transfer, but still relating to the summer season.

Thus, summer is continued here on the average four months and is characterized by three phases: beginning of summer (June), complete summer (July-August), decrease in summer (September). As a whole for the season are typical maximum value the insolations in the year (from 35 to 57% of possible sunshine); the yearly formation of hot and dry weathers; the frequent onset of cloudy in the daytime and completely cloudy (VI-VII classes) weathers (55-83%). In this season the greatest quantity of days with cloudbursts (11-23 in the month) and with the hail (from 2 to 11 days for the season) is observed; the maximum thunderstorm activity (in weathers of the IV class), which reaches very large sizes/dimensions - to 16 days in the month or to 45 days with the close or thunderstorm for the season. Is great a number of days with the fog/mist (to 18 in the month), which, as a rule, appears with the formation of weathers of the VII class, since it is connected with the low rain cloudiness.

Table. Recurrence of the classes of weather, %.

(1) Классы погод	(2) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
II						2	1	2	2			
III	1	—	2	16	7	7	13	18	28	34	13	2
IV б/ос (3)	—	—	1	11	15	22	23	23	16	7	5	1
IV с/ос (4)	—	1	1	5	12	22	14	12	5	5	2	2
V б/ос (5)	—	—	1	2	5	4	3	4	7	6	2	
V с/ос (6)	—	1	—	—	1	1	2	1	1	3	2	1
VI	—	—	1	5	12	11	10	10	10	6	2	2
VII	—	1	3	8	30	28	34	30	23	14	14	4
VIII	9	12	24	25	15	2	—	—	5	10	25	18
IX	12	13	14	14	1	—			2	11	14	12
X	2	4	4	1	—	1			—	1	3	4
XI б/в (5)	11	8	9	2	2	—			1	2	3	11
XI с/в (6)	46	43	35	10	—	—			—	1	14	37
XII б/в (5)	6	4	1	—						—	—	1
XII с/в (6)	12	12	4	1						—	1	5
XIII с/в (6)	1	1	—	—						—	—	—

Key: (1). Classes of weathers. (2). Months. (3). without precip. (4). with precip. (5). ~~anhyd~~ without water. (6). with water.

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Characterizing summer season isolated by us under thermal conditions of warm month in year (according to A. I. Kaygorodov), it is necessary to underscore following: on the average in 8 years of observations warm month proves to be July - 12.0°, but frequently it can be June or August with values greatest in given year of average/mean monthly temperature of air (from 11.6 to 14.3°). Thus, summer is predominantly moderately fresh, and in the separate years - by moderately warm, which corresponds to mixing in the plain of this

terrain on 20° to the north (to 68th parallel), where the thermal conditions of the summer of the topographical-climatic zone of tundra are compared with the thermal conditions of the high-altitude zone of the Ukrainian Carpathians in question: moderately cold thermal zone with the sum of efficient temperatures of 600-1000° (according to M. S. Andrianov).

In summer effect of Atlantic Ocean is noticeably weakened due to heating of air from terrestrial (underlying) surface. The role of relief as the local factor, which noticeably changes atmosphere circulation in this area is increased thereby, which affects the cloud and radiation conditions of the investigated and adjacent territories, the character/nature of moistening and as the final result all components of the thermal and water balances of this region.

~~It is~~ Analogous with July and August, January and February in the cold season of the year in view of absence of frostless weathers and noticeable preponderance (51-57%) of moderately frost weathers (XI class) are set aside.

~~cold pore of year.~~ In these months lowest absolute minimum temperatures (-26°--28°), which cause a decrease in its average/mean monthly values to -12.4--12.9° into the separate years are observed. Averages (in 8 years of observations) compose -7.3° during January and -6.8° during February, which makes it possible to define winter

as moderately soft as a whole, but with the deviations to the separate years to the moderately cold. The amplitude of the oscillation of the average/mean monthly temperature of air in these months is 2 times more than in summer months, i.e., the temperature conditions of winter is less stable than in summer. This is confirmed by large recurrence (21-25%) of weather with the transition of the temperature through 0° (VIII-IX classes), with which is connected the formation of thaws. Predominantly in the same months considerably frost (XII class) weathers (16-18%) are formed/shaped, and only during January and February (in the separate years, somehow in 1963) were noted strongly frost (XIII class). As a whole the thermal conditions of these typically winter months unessentially differ from the temperature conditions of the surrounding plains territories, which, just as the Ukrainian Carpathians, test/experience during this period the greatest effect of Atlantic Ocean, which affects, first of all, the temperature characteristic of winter season.

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Adjacent months - December and March under thermal conditions (average/mean monthly temperature always negative, absolute minimum temperatures not higher than -10°, they reach -22, -25°) and on explicit preponderance of frost weathers (XI class) - 44-48% - are related to winter season. Considerably frost weathers (XII class)

yearly are observed. However, noticeably grows/rises the recurrence of weathers with the transition of temperature through 0° (30-38%) and the frostless weathers of all classes (9-12%; 3-4 days in the month).

By analogy with summer season in winter we distinguish beginning of winter (December), nucleus/kernel (January-February) and end of winter (March). The general/common/total line of all winter months lies in the fact that in their weather mode/conditions predominate the frost weathers with the wind from 39% (during March) to 60% (during January), that must unfavorably be reflected in the labor productivity and the work of mechanisms on open air. It is necessary to consider also the ultraviolet deficiency, when solar altitude occurs below 25° and ultraviolet rays do not possess intense biological activity, mainly in November-December and January (and partially during February - in the the sub- and the post-meridian hours).

Transfer spring months - April, May and autumnal - October, November are characterized by preponderance of frostless weathers, but with even more considerable recurrence of weathers of VIII and IX classes (with transition of temperature of air through 0°) - 16-39%. Frost weathers yearly are observed. However, average/mean monthly temperatures of air always positive; maximum temperatures not lower

than 10°, in the separate years reach to 20. The frequent formation of the light cloud weathers of the III class and cloudless in the daytime of the V class during September and October (28-34% for the III class and 8-9% for the V class) explains more warm and dry autumn in comparison with the spring.

Meteorological mode/conditions examined detects characteristic feature of climate of middle latitudes: considerable diversity and large dynamicity of weather - frequent replacement of one class by another. The formation of moderately arid weather testifies about the manifestation of continentality.

Mutability/variability of weathers, their large dynamicity positively act on organism. Such climatic conditions with respect to the man can be considered as those hardening and training/aging.

Favorable for development of organic peace/world climatic special features/peculiarities for high-altitude zone being investigated upon detailed consideration of local weather special features/peculiarities will contribute not only to successful development in middle upland areas of Ukrainian Carpathians of mining/mountain-pasture stock raising and production of feeds for it, but also to conduct of forestry, plant growing (on slopes of southern exposures), to growing of medicinal plants as raw material for

therapeutic preparations, to realization of sport hunting, mountain tourism and mountain-skiing sport.

CHARACTERISTIC OF ILLUMINATION CONDITIONS IN THE DIFFERENT WEATHERS IN MOSCOW.

T. P. Aleshina.

During the last few years considerable attention is paid to the investigation of the effect of changes in the meteorological factors to the human organism. To such factors can be attributed the illumination, which has high value both in the biology and in the medicine.

It is known that illumination can come forward in role of conditioned stimulus, signalling to organism about weather change ("signals" of cooling or heating), in this case in organism of human and animal are observed changes edge reactivities, higher nervous activity, and also respiratory/breathing gas exchange (Ovcharova, 1963).

V. Ya. Yurazh (1965) in his investigations showed that with low illumination of 140 meteolabile patients was observed deterioration in health in 76 (54%), while with good illumination only in 15 (1%)

patients. Especially negatively affects low illumination patients with the neurasthenia, climax, atherosclerosis of the vessels of brain, and also with the traumatic encephalopathy.

V. N. Gerasimenko (1961) in his investigations also notes deterioration in health of patients with weather change.

N. N. Kalitina (1937), controlling illumination, it established that it depends on change not only solar altitude, but also transparency of atmosphere and albedo of underlying surface.

With investigations of effect of illumination dealt also N. F. Galanin (1939), M. V. Bylov (1951), T. V. Yevnevich and N. P. Nikol'skaya (1968).

However, works enumerated above characterize illumination without elaboration according to phyla/types (classes) of weather. The classes of weathers, isolated by E. Ye. Fedorov, besides other meteorological elements consider only a quantity of lower cloudiness, which to the larger degree weakens/attenuates illumination.

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Large material according to the structures of the climate of the

classes of weathers in the territory of the Soviet Union is at present accumulated.

It was find connection/communication of classes of weathers with illumination by purpose of this work. For this the five-year period (1961-1965) of illumination 12 hours of 30 min. (period of observations on the meteorological observatory of MGU) is investigated. Defined classes of weathers and the average values of illumination (table) are calculated. By the obtained results it is possible to judge the annual variation of illumination with the different classes of weathers on latitude of 55-56°.

As one would expect, greatest illumination with all classes of weather in summer is observed. In sunny weathers (I, II, III, V classes) the average values of illumination varied from 40 thousand to 70 thousand luxes. The greatest values of maximum illumination in these weathers fall on July - 90 thousand luxes. It should also be noted that the maximum illumination in these months was not noted below 63 thousand luxes. Weathers with the daytime cloudiness (IV class) are characterized by average/mean illumination - from 30 thousand to 50 thousand luxes. Cloudy (VI class) and rainy (VII class) weathers decrease the illumination 2.5 times in comparison with sunny weathers, and it is 25-35 thousand luxes in summer months.

Table. Average/mean illumination with the different classes of weather, thousand of luxes.

(1) Классы погод		(2) Месяцы I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
(3) Солнечная очень жаркая и очень сухая						63°							
(4) Солнечная жаркая и сухая						70	69	68	60	53°			
(5) Солнечная умеренно влажная и влажная					57	64	63	60	54	39	30	22°	
(6) Солнечная умеренно влажная и влажная с облачной ночью	б/о (7)				50	61°	54°	62	43	40	24	17°	
	с/о (8)				49°	68°	41°	59°	63°	32	27°	—	
(9) Облачная днем, малооблачная ночью	б/о (9)			16°	21	37	51	39	42	24	11	5°	
	с/о (9)				8°	34	36	32	38	20	4		
(10) Пасмурная без осадков		3°	—	9°	17	33	24	29	32	29	9	5	3
(11) Дождливая		6°	—	21°	19	24	23	33	26	21	7	4	3
(12) Очень жаркая и очень влажная	б/о (12)												
	с/о (12)												
(13) Погоды с переходом температуры через 0°	с облачным днем (14)	5	12°	20	27	33					12	5	4
	с ясным днем (15)	5°	19°	39	48						33	18	9°
(16) Слабо морозная		6	17°	21°							10°	5	4
(17) Умеренно морозная	я	13	23	34	51°						20°	13	7
	о	8	14	24	34						25°	7	4
(18) Значительно морозная	я	10	23	40								12°	8
	о	9	16									8°	6
(19) Сильно морозная	я	9°											

Key: (1). Classes of weathers. (2). Months. (3). Solar very hot and very dry. (4). Solar hot and dry. (5). Solar moderately moist and moist. (6). Solar moderately moist and moist with cloud night. (7). without precip. (8). with precip. (9). Cloud in the daytime, light cloud at night. (10). Cloudy without precipitates. (11). Rainy. (12). Very hot and very moist. (13). Weathers with transition of temperature through 0°. (14). with cloud day. (15). with clear day. (16). Weakly frost. (17). Moderately frost. (18). Considerably frost. (19). Strongly frost.

FOOTNOTE 1. The values of medium illumination, observed in a small number of cases.

In the transfer seasons especially in winter average/mean illumination with all classes of weathers the character/nature of cloudiness independent of had the smallest values. The smallest average/mean illumination, characteristic for December, is observed in the cloudy (VI class) and rainy (VII class) weathers and is reduced to 3 thousand luxes. In the weathers with the transition temperatures of air through 0° (VIII, IX classes) and frost (XI, XII, XIII classes) with the clear and cloudy bottom of the value of illumination are insignificant. Thus, average/mean illumination during the clear frost day oscillates from 5 thousand to 23 thousand luxes, and into the cloud - from 4 thousand to 16 thousand luxes. In spring with an increase of the solar altitude illumination during March is 2 times more with all classes of weathers in comparison with February, and during April - 3 times. For the autumn a decrease of a quantity of clear days and an increase in the cloud ones is characteristic. It is natural that the average/mean illumination in comparison with the summer is gradually decreased. During October the values of average/mean illumination decrease 2-4 times. For this month the essential difference in the average/mean illumination depending on the class of weather is characteristic. Thus, for instance, in the weathers with the transition of the temperature of air through 0° with the cloud day (VIII class) average/mean

illumination is equal to 12 thousand luxes, and in the weather with the clear day (IX class) - 33 thousand luxes; in the weathers with the daytime cloudiness without the precipitates - 11 thousand luxes, and with the precipitates - 4 thousand luxes (IV class).

This development showed good connection/communication of classes of weathers with illumination. On the basis of the structure of climate in the weathers it is possible to judge illumination for the areas, situated on latitude of 55-56°.

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