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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM -- SOVIET-BLOC ACTIVITIES

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I. GENERAL

Nesmeyanov Summarizes Two Years of Planetary Geophysical Observations

The simultaneous observation of geophysical processes on a planetary scale were organized for the first time in history in connection with the International Geophysical Year. In marking the second anniversary of the beginning of this period of geophysical and contiguous investigations, Academician A. N. Nesmeyanov, President of the Academy of Sciences USSR, briefly summarized the 2 years just completed, in an article published in Pravda. A summary of the article follows.

The program of the IGY will be completed on 31 December 1959, consequently the principal scientific results of the investigations and observations can be expected in the ensuing years. However, from the preliminary results of the work of the program it can be seen, that, on the basis of the collected materials, conclusions of great theoretical and practical value can be made.

For example, in the course of processing the data on meteorology, it has already been established that jet streams at altitudes of 9-12 kilometers are also observed in the temperate Zone and not only in the lower latitudes as previously supposed. They are even often observed above the Polar Circle.

Investigations of the stratosphere made it possible to ascertain that at high altitudes circulations of the terrestrial polar cyclone and the summer anticyclone in both hemispheres spread to the equator. Parallel aerological observations in the Arctic and Antarctic, first organized in connection with the IGY, showed that mobile cyclones in the Antarctic are of great intensity and have a frontal structure similar to arctic cyclones. In addition, essential peculiarities of stratospheric processes in the Antarctic, not observed in other regions of the Earth, were determined. This work was under the supervision of V. A. Bugayev.

The materials of rocket meteorological investigations made it possible to arrive at the conclusion that the temperature of the air in the polar latitudes increases beginning with an altitude of 30-32 kilometers. Thus, the region of cold in the stratosphere with temperatures of -80 and -90 degrees centigrade, earlier discovered by Soviet scientists at distances up to 24 kilometers above the surface of the Earth, is replaced at a higher altitude by a region with higher temperatures. This work was led by G. I. Golyshev. Analyses of the chemical composition of rainfall showed that in the European part of the USSR each hectare of ground yearly receives 3-4 kilograms of nitrogen, 5 kilograms of chlorine, 4-10 kilograms of calcium and 10-20 kilograms of sulphur from rainfall. This work was conducted by Ye. S. Selezneva.

Complex oceanological investigations of the world ocean, unprecedented in scope, are being conducted by many ships. Interesting conclusions were also obtained in this field. For example, it was shown that the depths of the oceans and seas cannot be used for dumping radioactive wastes because of the existence of vertical currents which would bear these wastes to the surface again. Considerable successes were achieved in the study of the deep circulation of the water, the interaction of the ocean with the atmosphere, and fluctuations in sea level.

Investigations of the Earth's ice covers, particularly in the Antarctic, give important data for solving problems of change in climate, for determining the role of ice in the evolution of our planet, and of their influence on a whole series of geophysical and geological processes.

In the simultaneous study of the gaseous, liquid, and solid envelopes of the Earth, investigations of the upper part of the Earth's atmosphere occupy a central place. The launching of artificial earth satellites and rockets in conjunction with the conduct of indirest observations from ground stations and observatories working according to the IGY program opened great possibilities in this field. Studies of the density, pressure and temperature in the upper layers of the atmosphere and of cosmic matter penetrating into the upper atmosphere from the Sun and from universal space are being conducted with the aid of artificial earth satellites.

The experiments conducted in satellites and rockets made it possible to carry out studies of ultra-violet, and X-ray radiation from the Sun and to detect and investigate the zone of cosmic radiation near the Earth, the concentration of meteoric matter in space and to conduct a number of other experiments extremely interesting from the viewpoint of astrophysical research.

All of the work in the field of astrophysics fulfilled in the process of direct investigations of cosmic space is of interest not only from the viewpoint of knowing the universe but also from the viewpoint of studying our own planet. Accumulated scientific data permits a wider cosmogonic generalization, and to know more about the structure, composition, and evolution of the Earth. They are also necessary for studying the atmosphere and for clarifying a number of problems on the physics of the Earth, of geodesy and geology.

The period of observations according to the IGY program coincides with the period of maximum solar activity. Observations of phenomena on the Sun have been increased considerably in the USSR during this period. The work of the Soviet geomagnetologists N. V. Pushkov, S. Sh. Dolginov, Yu. D. Kalinin, and others, on the materials obtained with Sputnik III led, for example, to the conclusion that both main parts of the permanent geomagnetic field, the field of homogeneous magnetization and the field of world

anomalies, decrease in proportion to the distance from the Earth's surface at approximately the same speed. This means that the source of the field of world anomalies lies at the same depth in the Earth as that in which the field of homogeneous magnetization arises. Analyzing these data, scientists consider that the "ferromagnetic" theory of geomagnetization explaining the main part of the geomagnetic field by natural magnetization of the Earth's crust, is unfounded.

The study of geomagnetic storms, now being registered by a network of stations with very high accuracy, made it possible for V. I. Afanas'yeva, V. A. Troitskiya, and other specialists to arrive, each in his own field, at interesting and prospective conclusions. For example, it was established that magnetic storms in which short period variations are absent are caused by corpuscular streams passing by the Earth. A characteristic change in the periods of pulsation within the limits of intense magnetic storms was noted. In connection with these, it is assumed that the corpuscular flow gradually disturbs the layers of the atmosphere nearer and nearer the Earth, and the periods change in accordance with changes in the electrical parameters from layer to layer.

The Zarya, only non-magnetic ship in the world, has traveled about 48,000 nautical miles conducting continuous observations under the supervision of M. M. Ivanov, chief of the expedition, according to the program adopted. Despite the fact that the processing of the Zarya's material has only just begun, a number of new facts have already been noted. For example, over a great number of depths in the Atlantic, earlier unknown magnetic anomalies have been discovered. In certain regions great inaccuracies in existing magnetic maps have been revealed.

Stations for observations of aurorae in the USSR are equipped with new A. I. Lebedinskiy camera systems. Other improved instruments also make it possible to study complex magnetic phenomena. Investigations, with the aid of rockets and satellites, helped in obtaining interesting information on the structure of the upper part of the ionosphere. The distribution of electron concentration was calculated; it was established that the number of electrons in the upper part of the ionosphere is 3.6 times greater than in the lower part. On the basis of the calculation of neutral particles in the atmosphere, the limit of the Earth's atmosphere, that is, where the density of the atmosphere is equal to that of interplanetary gas, was placed at 3,000 kilometers. These calculations are the first attempts to determine the thickness of our atmosphere according to radio data.

The well-organized set-up for the vertical sounding of the ionosphere in an expanded station network is the basis for many important generalizations. Work in this field is conducted by N. P. Benkova and other specialists on the ionosphere. It has been established that in forecasting ionospheric conditions, all the manifestations of solar activity in all of its

varieties must be taken into consideration and not only separate forms of such manifestations. As a whole, the forecasting of conditions in the ionosphere, important for radio communication, has been considerably improved. Observations conducted on atmospheric disturbances are of great benefit in calculating the range of working frequencies in radio communication.

Information concerning earlier unknown meteor streams was obtained, the position of their orbits in the solar system was determined, and such parameters of the upper atmosphere as density, pressure, and temperature were calculated according to meteor photographs. This work was under the supervision of V. V. Fedynskiy and V. P. Tsesevich.

As a result of complex investigations of cosmic rays, valuable data concerning variations in the intensity of cosmic rays were obtained which aid in defining their sources and their relation to solar activity, magnetic, meteorological and other geophysical factors. This work was led by S. N. Vernov.

Valuable data on earthquakes in the Arctic and Antarctic was obtained under the supervision of Ye. F. Savarenskiy. The results of large-scale expeditionary operations on the study of the Earth's crust in the Kuril-Kamchatka zone by deep seismic sounding are of great scientific and practical value.

One of the comparatively new methods of studying the internal structure of the Earth is the investigation of elastic earth tides. It is known for example, that in Moscow, the tidal wave in 12 hours can reach 50-60 centimeters. This means that the whole city is raised in a vertical direction a half meter twice a day. Work in the field of earth tides (Yu. D. Bulanzhe and N. N. Pariyskiy) showed the importance of conducting observation at points remote from oceans and especially in Central Asia where the indirect effects caused by the shifting of the water masses of the oceans are not felt.

Observations on irregularities in the rotation of the Earth, the speed of propagation of radio waves and movements of the Earth's poles are being successfully conducted. This work is supervised by A. A. Mikhaylov.

Nesmeyanov concluded his article with the following paragraphs:

"In connection with the contribution which the Soviet Union is making in the realization of the accepted program of geophysical investigations, the authority and prestige of the USSR in international geophysical investigations has grown. Soviet scientists take an active part in their activities. The vice president of the Special Committee (International) for the IGY, and the International Union of Geodesy and Geophysics is V. V. Belousov. A world center for collating and distributing all the data gathered is located in Moscow. It is directed by P. K. Yeveseyev.

"To more fully use the efforts and means spent by the countries in the conduct of the observations, it is necessary to organize a planned scientific processing of the unique data which is arriving in the USSR from 65 countries.

"It would be proper to call the years 1960-1962 the main period for the scientific and practical assimilation of the results of observations according to the IGY program. Special attention must be given by all IGY participants during this period to the study, analysis, and the comparison of all of the results of the observations. The processing of data must be accomplished with the use of modern computer techniques and the most efficient methods. The assimilation of IGY materials will lead to raising the level of geophysics and its associated sciences, to the substantial expansion of our knowledge of the Earth, to progress in the solution of such practical problems as weather forecasting, the mastering of the oceans, the determination of prospects for changing the climate, the study of the regimes of rivers, forecasting conditions for radio communication, prospecting for useful minerals, ensuring cosmic flights, and also in many other areas, part of which at present cannot even be determined. One can be sure that Soviet scientists will successfully cope with this complicated task." (Our Knowledge of the Earth is Expanding," by A. N. Nesmeyanov, President of the Academy of Sciences, USSR; Moscow, Pravda, 1 Jul 59, p 5)

Bardin Urges Speed in Assimilation of IGY Materials

Academician Ivan Bardin, vice-president of the Academy of Sciences USSR and chairman of the Interdepartmental Committee for the Conduct of the IGY [USSR], says in an Izvestiya article, that the successful scientific assimilation of all IGY materials is the basic contribution of Soviet scientists-geophysicists to the general creative activity of the Soviet people.

Bardin predicts that in the fulfillment of the requirements of the Seven-Year Plan, the Soviet people as never before will feel the need for reliable weather forecasts, a knowledge of climate changes, data on rivers, and information on ocean currents and oceanic productivity. The specific problem of the general circulation of the atmosphere will therefore be emphasized in the processing of the IGY material. Investigations of the ionosphere will contribute greatly in the fulfillment of the requirements of the Seven-Year Plan for the development of long-distance radio communication. In connection with the IGY the number of ionospheric stations were more than doubled, whereby information concerning those regions previously not studied was obtained. The problems of terrestrial magnetism and terrestrial electricity solved on the basis of IGY materials acquire special value for studies of the upper atmosphere studies of the phenomena occurring in plasma, and for the prospecting for useful minerals.

Especially important in the assimilation of IGY materials is the proper organization and apportionment of work. Therefore, says Bardin, in deciding the stage of the work it is especially important to retain and develop the experience of all-union planning and coordination in the field of geophysics. The Soviet (Interdepartmental) Committee of the IGY with the participation of 16 departments has developed an over-all plan according to which the assimilation of IGY materials must be begun this year. At the last annual meeting of the Academy of Sciences USSR, among the most important directions established for Soviet Science was "Complex Geological Investigations of the Structure and Evolution of the Earth".

Bardin, in his article noted that much consideration is being given to the processing, assimilation, and publication of IGY materials throughout the whole world. The coordination of scientific research works on IGY materials stands as one of the basic tasks of the new International Committee for Cooperation in Geophysics which has already begun its activities.

In order that the assimilation of IGY materials in the USSR be done successfully and in a short time, he said, it is already necessary to concentrate the use of qualified specialists in this work. "It is necessary to organize the processing of materials with the aid of the newest computer techniques, and in a number of cases to create special groups and bureaus for processing IGY data. Ministries, departments and institutions must not lower the level of geophysical works because the period of observations according to the IGY program will be completed at the end of this year. Observations are only the first stage of the work. The second stage of the work is at hand. It is important that the processing and assimilation of the IGY data be included in the departments along with the basic scientific problems and directions. The Soviet IGY Committee is convinced that all the many thousand collectives of IGY participants, clearly recognizing the importance of the problem facing them, will ensure, with the aid of the supervisors of the corresponding departments and institutions, the high level and necessary tempo of scientific investigations based on the materials of the IGY." ("The Earth in the Laboratory," by Academician I. Bardin; Moscow, Izvestiya, 1 Jul 59, p 4)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Rocket Launched, Dogs and Rabbit Recovered, Soviet Scientists Comment

The following TASS report on the launching of a geophysical single-stage ballistic rocket on 2 July was carried in the 7 July issue of several Soviet newspapers.

"As is known, systematic investigations of the upper layers of the atmosphere with the aid of single-stage ballistic rockets at various altitudes have been carried out in the Soviet Union over a period of several years. In the course of earlier conducted launchings, extremely valuable scientific materials were obtained which throw new light on the state of the upper layers of the atmosphere and the processes originating in them. These were reported previously in the press.

"On 2 July 1959, at 0640 Moscow Time, the launching of one of a series of geophysical single-stage intermediate-range ballistic rockets was carried out in accordance with the plan of scientific works for the investigation of the upper layers of the atmosphere.

"The rocket was equipped with apparatus for studying the ultra-violet part of the solar spectrum, the structure of the ionosphere, micrometeoritic streams, the direction and velocity of air currents at different altitudes, and also apparatus for determining the density, pressure, temperature and composition of the atmosphere according to altitude.

"Experimental animals, two dogs (Otvazhnaya and Snezhinka) and one rabbit, were placed on board the rocket in order that the vital functions of animals during the ascent to a great height might be studied. The dog Otvazhnaya had already made three flights in rockets.

"The total weight of the scientific apparatus and animals lifted by the rocket was more than 2,000 kilograms.

"The launching proceeded normally. A recovery system ensured the landing of the compartment and the container with the scientific apparatus and the experimental animals which were separated from the rocket.

"According to preliminary data, the program of investigations was fulfilled and valuable materials on all the problems were obtained.

"For the first time information concerning the composition of light gases in the atmosphere was obtained.

"The condition of the animals after landing was good. Repeated flights by the same animals made it possible to obtain data on the adaptability of animals to flights in rockets. New data on the behavior of animals in conditions of weightlessness were obtained.

"The materials are being processed and studied."

Comments of Soviet Scientists

"'The launching of the ballistic rocket to a great height with equipment and experimental animals is one of the great successes of Soviet Science,' says E. Mustel', Corresponding Member of the Academy of Sciences USSR. 'It was very important that the animals and equipment were returned to Earth in complete safety. Because of this, the scientific data, which will be obtained from an analysis of the materials of this flight, will acquire special value. The study of the atmosphere is of great practical value at present. It is especially important to know the mechanism of its formation.'

"Academician A. Dorodnitsyn writes as follows:

"'The launching of the geophysical rocket conducted in accordance with the plan of investigations of the upper layers of the atmosphere will contribute much new information to our knowledge of this hitherto very-little-studied region of the atmosphere. The realization of Man's great dream, flight beyond the limits of the Earth and flights to other planets, is impossible without a full and sure knowledge of the conditions which exist beyond the Earth's atmosphere in interplanetary space....'

"'To These problems precise, clear answers must be obtained. Only after this will it be possible to make the next deciding step in conquering the cosmos, to launch a manned rocket in interplanetary flight. As is obvious from the enumerated problems set for the apparatus on the single-stage ballistic rocket which made its flight on 2 July, science will obtain new data on a wide circle of problems and our knowledge concerning the upper layers of the atmosphere will substantially move ahead.

"'That part of the program of investigations which is connected with the study of the vital functions of animals during ascent to a high altitude is of particular importance. The flight of the two dogs and the rabbit and their safe landing made it possible to obtain data concerning the adaptability of animals to unusual conditions of high G-loads and weightlessness. This flight of the rocket, furthermore, makes it possible to obtain information concerning the properties of the upper atmosphere needed for more "ground work," as for example, for increasing the reliability of long-range radio communication and for studying the conditions of high altitude flights.'"

("The Attack on the Upper Atmosphere Continues"; Moscow, Izvestiya, 7 Jul 59, p 1)

Sedov Calls Mechta Greatest Achievement of Modern Science

The launching of the Soviet cosmic rocket, Mechta, toward the Moon occurred 6 months ago. In marking the anniversary of the firing, Pravda published an article by L. I. Sedov, academician, that contained the following obscruations.

The creation of the multistage cosmic rocket and its successful launching toward the Moon are the greatest achievement of modern science and engineering. The building of this rocket is the natural continuation of the work on intercontinental rockets and artificial earth satellites being conducted in the Soviet Union. The rocket's flight in space made it possible to realize a complex of most important scientific experiments for investigations of the interplanetary medium. The possibility of conducting direct scientific measurements at such great distances from the Earth was realized for the first time.

The photograph of the sodium cloud, ejected by the cosmic rocket on 3 January at 3:56:20 hours is a valuable scientific document. The unique picture was made at the astronomical station of the Pulkovo Observatory, Academy of Sciences USSR, in the Kislovodsk region. ("A Half Year Around the Sun," Moscow, Pravda, 2 Jul 59, p 6)

III. UPPER ATMOSPHERE

New Telescope for the Crimean Observatory

An article by Lenin Prize winner B. Ioannisiani, chief designer, published in Izvestiya describes the new telescope being built for the Crimean Astrophysical Observatory.

A number of large astronomical instruments are being built in the USSR at present. The largest of these is a parabolic reflecting-telescope with an aperture (mirror diameter) of 2.6 meters. The creation of this telescope, the largest in Europe, is an exceptionally complex task. It is a precise optico-mechanical instrument, fully automatic. Tracking of any celestial object is accomplished automatically.

The glass mirror of the telescope weighs more than 4 tons and its outside diameter is 2.65 meters. A great achievement of the Soviet optical industry is the preparation of the blank for the main mirror of glass having a low coefficient of linear expansion. Special programed furnaces were constructed. In these, tempering of the glass for relieving internal stresses was carried out for 5 months. The reflecting surface of the mirror must be finished with the greatest accuracy. To obtain good images of celestial objects variations in the specified shape of its surface must not exceed one one-hundredth of a micron.

The 70-ton moving part of the new telescope rests on liquid friction bearings, so-called "liquid cushions," thanks to which smoothness and ease of operation are achieved.

The new gigantic instrument can be directed from central or auxiliary control panels. A number of operations, which astronomers were previously compelled to perform manually, are automatic in this telescope. Various calculators, coordinate transformers, and other mechanisms are used for this purpose. On the whole, this enormous instrument is equipped with approximately 160 different electrical machines.

It is known that the medium through which the light from the stars to the mirror passes has a strong effect on the quality of the image. Non-uniform heating of the atmosphere in particular serves as a serious disturbance. Therefore, the construction of the tower and its 20-meter diameter dome, where the telescope will be housed, is of great importance.

The tower, equal in height to a ten-story building, is being constructed at the Crimean Astrophysical Observatory. Special thermal construction was employed for protecting the instrument from the hot Crimean Sun. To eliminate alternate heating and cooling of the instrument, a special conditioning system will be used to maintain the temperature of the air in the room below the cupola at the temperature expected at night.

"The general assembly of the telescope is now being sucessfully accomplished. Upon being placed into operation, the gigantic telescope will open new reaches of the universe to Soviet astronomers, and will ensure new victories for Soviet science." ("Farsighted Giant," by B. Ioannisiani; Moscow, Izvestiya, 24 Jun 59, p 4)

Soviet Reports Given at Cosmic Ray Conference

A new and original method of measuring the energy of cosmic particles which was developed in Moscow State University was reported by N. Grigorov, Soviet scientist, at the International Conference on Cosmic Rays which is being held in Moscow. The method, said Grigorov, makes it possible to conduct measurements of particles of any energy.

Also of great interest was a report on the works of a group of Soviet scientists under the supervision of N. Dobrotin, on the observation of the interaction of neuclons with atomic nuclei. These studies were conducted in the Pamirs. ("Messengers From Space"; Moscow, Pravda, 7 Jul 59, p 4)

East German Report on 6 December 1957 Meteor

On 6 December 1957, at 1225 Central European Time, an unusual natural phenomenon was observed in Thuringia and the bordering areas of Upper Franconia. The author, coming out of the Sonneberg Observatory, noticed a silver cloud formation in the otherwise cloudless northwest sky and immediately suspected its connection with a large meteor. This was confirmed when, after about 2 1/2 minutes, the sound was heard, a clap followed by a crescive and decrescent rolling of thunder lasting 25 seconds. If it is assumed that the cloud formed just shortly before it was first observed, the distance of the sound source was about 50-60 kilometers; the trigonometric determination arrived at later was 56 kilometers. Requests via the press and radio brought in a great volume of observation data. In spite of the bright sunshine, the fire ball was observed over a large area. Many observers saw only the cloud or were attracted only by the sound of the thunder. The Institute of Mineralogy of the University of Jena (Professor

Dr Heide), which was informed immediately because of the suspicion of the falling of a meteorite, conducted, together with the Sonneberg Observatory, searches and measurements in the suspected area of the fall near Oberhof in the Thuringian Forest. Collected statements of witnesses helped considerably to establish the details of the phenomenon, even though no fallen meteorites were found.

A determination of the path through the atmosphere showed that the meteor came from a direction 18 degrees east of south with a 27-degree inclination to the horizon. In the reverse direction the path indicated a point (apparent radiant) at 273 degrees right ascention and minus 10.5 degrees declination in the Constellation of Ophiucus, slightly to the west of the shield. The projected path leads almost due east past Coburg to the Thuringian Forest. The motion of the meteor was retarded by the resistance of the atmosphere at an altitude of 30 kilometers over a spot 10 47 E and 50 43 05 N, 5 kilometers east-northeast of Oberhof. Here the upper, most intense part of the vapor trail was formed. From this point, the trail extended steeply upward to a height of 26 kilometers. Short-lived traces of vapor, however, were observed down to a height of 16 kilometers, indicating the falling of a meteorite. The strong explosion at the point of retardation by the atmosphere leads to the assumption that it was a stone meteorite which disintegrated into fragments. Accordingly, a disperse fall was expected over a region somewhat north-northwest of the projected point of retardation, that at about 10 46 E and 50 46 N. Unfortunately, a heavy snowfall prevented the search for fragments directly after the event.

Descriptions of the fire ball indicated that it was red at first and ended up as a very bright bluish white light, signaling the formation of the spherical upper part, about 300 meters in diameter, of the 4-kilometer long vapor trail. The trail showed extensive changes of form after only 3 minutes; it spread out to one side, becoming diffuse, and moved off slowly toward the east-northeast. Measurements of the wind over places where the vapor trail was located showed, for a height of 30 kilometers, a west-southwest wind moving seven meters per second. After 30 minutes had elapsed, the vapor cloud was no longer visible because of further spreading and lack of contrast.

The thunder was perceived with rare integrity -- 70 reports from 59 places. The sound field was approximately elliptical in shape with the greatest distance from west-southwest to east-northeast, and with axes 125 kilometers and 70 kilometers in length. The end of the meteor path was considerably off-center in the western part of the sound field. The sound carried 40 kilometers to the west-southwest and 85 kilometers in the opposite direction. It is considered possible that the short distance to

the edge of the zone of obtained information on the western side was a hindrance, nevertheless subsequent inquiries were made even beyond this zone, and several observations from region of Coburg contained no information regarding the hearing of any sound. The assymmetry was assumed to be the result of the west-southwest wind at high altitude. This new case very clearly confirms a phenomenon observed earlier by other authors, namely that, when the path is flat, the greatest intensity of the sound is observed not below the end point, but below parts of the path lying farther to the rear. In the present case it was particularly strong in the region of Schmiedefeld and Giessuebel in the Thuringian Forest where the thunder was of such an intensity that the people of the region were of the opinion that they had felt slight vibrations, and some even suspected an earthquake. It is concluded that the sound source could have extended over the last 20-30 kilometers of the meteor path.

By way of comparison with similar events of the recent past, seven meteorite falls in Germany have been proved since 1900:

Forsbach near Koeln on 12 June 1900, weighing 0.24 kilogram;

Treysa, Hessen, on 3 April 1916, weighing 63 kilograms;

Simmern, Hunsrueck, on 1 July 1920, weighing 0.61, 0.47 and 0.14 kilogram;

Oesede near Osnabrueck, on 30 Dec 1927, weighing 3.6 kilograms;

Beverbruch, Oldenburg, on 10 September 1930, weighing 11.7 and 4.8 kg;

Breitscheid, Dillkreis, on 11 August 1956, weighing one kilogram; and

Ramsdorf, Muenster, on 26 July 1958, weighing 4.68 kilograms.

Only in the case of the Treysa fall was the meteorite found months later as a result of a determination of the path, but there it was a case of a large iron mass. The closest comparable fall to the one reported here was that at Simmern on 1 July 1920, when at 0910, during bright sunshine, a fire ball, followed by loud thunder, was observed. Conditions were much more favorable in that instance, since a lot of people were busy about the countryside with the hay harvest. The fall of the meteorites was heard at eight places, but only three were found. These eight places lie on a line 18 kilometers long and about 2 1/2 kilometers wide. The altitude was almost the same as in this present case, but the path was almost flat, which accounts for the great length of the field of scatter.

In addition to these seven cases, there are, for the same period, at least two other descriptions of similar phenomena, for which the optical and acoustical observations point to the fall of masses, but for which no meteorites were found.

A detailed report on the meteor fall of 6 December 1957 will appear in the periodical Die Sterne, published by Joh. Ambr. Barth, Leipzig. ("The Great Daytime Meteor of 6 December 1957," by C. Hoffmeister, Sonneberg Observatory; Berlin, Monatsberichte der Deutschen Akademie Der Wissenschaften zu Berlin, Vol 1, No 1, 1957, pp 2-4)

IV. METEOROLOGY

A New Theory on the Formation of Precipitations Being Tested in USSR

A new theory on the formation of hail and rain showers which may possible lead to finding methods for acting upon these processes had been reported in the Soviet Union.

G. Sulakvelidze, chief of the El'brus Expedition of the Institute of Applied Geophysics, Academy of Sciences USSR, reports that the theory was developed by a group of the expedition's young scientists.

The Chegem detachment of the El'brus Expedition has begun operations in the region surrounding the village of Lechinkaya with the aim of checking the theory and defining the problems of the methods of action.

The main base of the party is located 4 kilometers from Lechinkaya on a ridge separating Chegem and the gorge of Baksan. Microphysical traps for determining the size of hail and rain particles, and metallic corner reflectors with the aid of which the speed and direction of air currents in the cloud will be determined by radar, will be dropped from airplanes flying over this region.

The trap is a metallic device weighing 5-6 kilograms which is lowered by parachute. In addition, the cloud will be seeded from the airplane with silver iodide crystals.

Besides the aerial operations, the detachment disposed about 20 pluviographs (metallic cylinders 1.5 meters high) in the Nal'chik and Chegem Gorge to determine the quantity and intensity of precipitations (rain). ("Microphysical Traps Dropped From Airplane...," Moscow, Sovetskaya Aviatsiya, 1 Jul 59, p 4)

V. ARCTIC AND ANTARCTIC

Report From New Soviet Station Lazarev

Lazarev station is located on an ice shelf near Princess Astrid Coast. A staff of seven Soviet polar scientists have been working here for over 3 months, continuing the work of the IGY program.

It is now the period of the polar night. Only for a short time around noon the sky lightens faintly, reminding one of the "white nights" in Leningrad. The winter is relatively mild. This is caused by the moderating influence of the vast water masses of the ocean. Thus, the average temperature of the air in May and June was minus 18 on 19 degrees centigrade. However, there are days when the temperature drops to minus 30 to 35 degrees. The storms have slightly abated, but snowfall is continuing.

After the storms, with winds reaching 35-40 meters per second, one can observe icebergs breaking off the western edge of the ice shelf "tongue," 8-16 kilometers north of the station. Studies are being made of the formation of these huge icebergs.

The average height of radiosonde launchings during the winter reaches 17 kilometers. Studies are made of the temperature of the snow cover, of its structure by layers, and of the microrelief of the snow surface. As a result of magnetic storms, radio contact with Mirnyy is often distrupted. I. Ozerov, radio technician, is testing a subsnow antenna, built into a 25-meter deep hole. ("Radio Report From Queen Maud Land," Moscow, Vodnyy Transport, 2 Jul 59)

Exploration of New Mountains in Antarctica

Four Soviet geologists, including Prof M. Ravich, Pavel Voronov, Dmitriy Solov'yev, and Lev Klimov, members of the Fourth Antarctic Expedition, spent some time exploring the mountains of Queen Maud Land, in a region where no human being had previously set foot.

In February and March 1959, while the new station Lazarev was being set up on Princess Astrid Coast, the scientists explored the eastern part of the mountain region, extending over 1,000 kilometers, with the help of a light AN-6 airplane. For the first time Soviet scientists saw these mountain ranges which have a strange beauty, often quite unlike any "earthly" mountain scenery. From a distance some of the mountain peaks appear translucent, like rock crystal. Flat peaks alternate with pointed and pyramidal peaks. Gigantic needles of rock rise vertically to the sky.

This majestic mountain wilderness of Antarctica is rich in various minerals, including useful minerals such as mica, graphite, iron, and apatite. The Soviet scientists called this region a geological paradise; the history of the rocks could be read from their surface, polished by the glaciers.

A field camp of three tents was set up in the center of these mountains, about 150 kilometers south of the place where the Ob' was anchored at Princess Astrid Coast. The newly discovered mountains in this region were called the Russian Mountains; they were first sighted from an airplane by Dubinin, captain of the Ob', during a search for a site to build the new station. The Czech astronomer Antonin Mkros joined the flight party for the specific purpose of determining the exact location of the mountains, which had not been shown on any of the existing geographical maps.

On 14 February, a heavy snowstorm with winds of 50 meters per second was raging near the coast, where the Ob' was anchored. However, the storm had not yet reached the mountain area and the weather there was calm. The plane left the coast at 0700 hours. After an hour's flight, the mountains had disappeared. For many kilometers ahead only the surface of the ice sheet, crossed by many crevasses, was visible. Then suddenly the contours of numerous new mountain peaks were outlined on the horizon.

A dark cliff, resembling the monument to Peter I in Leningrad, was visible directly below the wing of the airplane. This rock has now been given the name of the well-known Russian polar explorer Vladimir Rusanov. Next to it is another mountain, resembling a 100-story skyscraper; it consists of a brown monolith of granite, with white lenses of quartz scattered over its surface, giving them the appearance of windows.

It was impossible to land the plane near these cliffs. After a long search for a landing site, the AN-6 finally landed on a strip of snow descending from one of the lower mountains. At the foot of this mountain, at an altitude of 2,000 meters, a snowstorm broke out and the air temperature dropped to minus 20 degrees centigrade. The characteristic antarctic wind formed by cold air masses from the interior of the continent, in combination with the snowstorm, made it impossible to climb the mountain.

Only the most persistent efforts made it possible to explore the mountain, named Zhelannaya (Desired One) by the Soviet scientists. Here numerous rare minerals were accumulated in their natural form. Through the efforts of A. Mkros, the location of the Russian Mountains will now be entered accurately on the map.

The heavy snowstorm began on 15 February and continued for 3 days, during which it was impossible to leave the tent. With the help of a gas stove, the temperature in the tent was maintained at about 3 degrees centigrade. On 19 February, the weather cleared and the flights to the unknown mountains continued.

Explorations in this region continued for 10 days. The antarctic fall was approaching and sunny days were becoming less frequent. However, flights continued even when the temperature had dropped almost 10 degrees. The plane later took off from the landing strip near the station Lazarev, where the first buildings had been erected by this time.

Some of the mountain peaks assume the most fantastic shapes. Steep cliffs rising to 500 meters alternate with higher peaks resembling sharpened pencils. Other peaks have the form of strange wild beasts, crumbling fortresses, or phantastic trees. Some ranges resemble caravans of camels, and others look like ruins of cities. The scenery has an almost unearthly aspect; it seems like a landscape on the moon.

Individual cliffs with heights of several hundred meters rise almost vertically to the sky. Intricate patterns of folds appear on their surface, consisting of the most ancient, brown and green metamorphic rock. Some of the rocks are split up into separate blocks. As a result of movement and friction against one another, the surfaces of the blocks have been polished to mirror-like smoothness. Mica-bearing veins are found between the blocks. Some rocks consist of rose-colored granites, and others of snow-white marble, the sediments of the oldest seas on the Earth. The marble is so saturated with various crystals that the rocks represent a natural mineralogical museum.

The scientists collected valuable geological samples in the mountains. As a result of their work, the first schematic geological map of the eastern part of Queen Maud Land will be published. The collected material will throw light on many problems concerning the origin of the most ancient metamorphic and magmatic rocks on the Earth.

Lazarev station was opened on 10 March. A small group of men, headed by Yuriy Kruchinin, remained here for the winter to conduct year-round observations of various natural phenomena. ("Among Unknown Mountains," Moscow, Vodnyy Transport, 30 Jun 59)

Hydrographic Expedition in Kara Sea

The hydrographic expedition, which started out in February and covered 1,600 kilometers over the ice of the Kara Sea, has been completed successfully. The sled-tractor train with members of the expedition traveled along a complicated route. The polar scientists had been given the task of studying the relief of the ocean bottom in a vast area of the northeast portion of the Kara Sea.

Over 15,000 holes were drilled in the 3-meter thick ice for the purpose of taking ocean depth measurements. Navigational signs were set up along the route. ("1,600 Kilometers Over the Ice of the Kara Sea," Moscow, Pravda, 25 Jun 59)

Service Anniversary of Polar Scientist

Recently, the Piramida Mine on Spitsbergen celebrated the 25th service anniversary of Nikolay Vasil'yevich Onufreychik, hydrometeorologist. He has been working in the Arctic continuously since 1934. He acquired a number of specialties required for the study of the Arctic and worked at many polar stations, including Mys Zhelaniya, Dikson, Medvezh'i Ostrova, and as chief of the meteorological station at Spitsbergen.

In connection with the IGY program, N. Onufreychik was again sent to Spitsbergen as an experienced specialist.

A large crowd was gathered in the club of the mine to honor the veteran of the Arctic. ("Anniversary of Polar Scientist," Moscow, Vodnyy Transport, 2 Jul 59)

New Geographical Names in the Arctic

The Council of the Geographical Society USSR has approved the names of a number of geographical features, discovered by Soviet explorers in the Arctic Ocean.

The central, deep-water portion of the ocean, bordered by the slopes of the continental shelf, will in future be called the Arctic Basin.

The submarine mountain range, extending parallel to the Lomonosov Range across the Arctic Basin (from the area of Ostrov Vrangelya to Ellesmere Island in the Canadian Arctic Archipelago) has been named Mendeleyev Range.

Names have been assigned to specific parts of the Arctic Basin. The portion adjoining the Atlantic Ocean, bordered by the Lomonosov Range, has been named the Nansen Trough (kotlovina), and the portion between the Lomonosov Range and Mendeleyev Range has been named the Makarov Trough. The area with the greatest depth (5,220 meters) discovered in the Nansen Trough during the drift of the icebreaker G. Sedov has been called the G. Sedov Depression (vpadina). Another depression in the same basin has been called the Icebreaker Litke Depression.

In honor of the Soviet diesel electric ship Lena, the trench cutting through the Nansen Sill in a submeridional direction, in the northern part of the Greenland Sea, has been named the Lena Trench (zhelob).

The bank near the Northeast Cape of Greenland has been named the Ob' Bank in honor of the diesel electric ship by that name.

The northwestern submarine extension of Spitsbergen will be called the Yermak Plateau. ("On The Map Of The Arctic," Moscow, Pravda, 30 Jun 59)

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