CIA/PB 131632-95

UNCLASSIFIED - INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1959

DECEMBER 4 1959

PB 131632-95

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December 4, 1959

U. S. DEPARTMENT OF COMMERCE
Business and Defense Services Administration
Office of Technical Services
Washington 25, D. C.

Published Weekly
Subscription Price $12.00 for the Series

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, October 28, 1959

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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM--SOVIET-BLOC ACTIVITIES

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Book on Far-Side Photographs Published

The first scientific publication on the preliminary processing of the photographs obtained from the automatic interplanetary station, the third Soviet cosmic rocket, has been published under the title Pervyye fotografii obratnoy storony luny (First Photographs of the Far Side of the Moon) by the Publishing House of the Academy of Sciences USSR. The book gives information on the layout of the automatic interplanetary station and describes its flight, the process by which the unseen side of the Moon was photographed, and the transmission of the pictures to Earth. The first photographs of the Moon's far side appear in the book and its characteristics are described.

The foreword was written by A. N. Nesmeyanov, president of the Academy of Sciences USSR. Circulation is 150,000 copies. ("First Photographs of the Reverse Side of the Moon"; Moscow, Pravda, 14 Nov 59, p 4)

Possible New Type Sputnik

A meeting of the Sweden-USSR Society celebrating the 42d anniversary of the October Revolution was held at the Stockholm Concert Hall on 8 November. Among the events on the program was the showing of a film on Russian technological progress, primarily in the satellite field up to and including Lunik II's Moon impact. The film included several glimpses of a sputnik model of about the same dimensions as the third Soviet cosmic rocket. This new model has not yet been reported as having been launched. In general, the film appeared to be a composite of documentaries, some of which have previously been seen in Sweden. ("New Sputnik Type"; Stockholm, Dagens Nyheter, 9 Nov 59, p 11)

II. UPPER ATMOSPHERE

Effect of N_2 Concentration on Recombination in Ionosphere

The effect of ion-molecule interchange on the value of the effective recombination coefficient in the ionosphere is discussed. It is shown that N_2 concentration is a parameter determining possible change in the character of the recombination with altitude. ("On the Question Concerning the Effective Recombination Coefficient in the Ionosphere," by B. A. Bagaryatskiy, Institute of Physics of the Atmosphere, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 9, Sep 59, pp 1359-1363)

III. METEOROLOGY

Work on Atmospheric Optics To Be Coordinated by Subcommission on Radiation

The All-Union Conference on Actinometry and Atmospheric Optics was held in Leningrad from 28 January 1959 to 4 February 1959. The conference was organized by the Commission on Physics of the Atmosphere, Academy of Sciences USSR, by Leningrad State University, and by the Main Geophysical Observatory. The conference revealed that research in actinometry and atmospheric optics has advanced considerably in the USSR since the last conference was held 1½ years ago in Tartu. A total of 102 reports were read and discussed. Individual sessions were devoted to the following subjects: radiation balance and its components, brightness and polarization of the day and night sky, the reflecting capacity of the Earth's surface, the theory of transfer of radiation in the atmosphere, and methods of actinometric measurements. A separate group of reports was devoted to the theme "Radiation and Design."

Those present at the conference concluded that the conference served a useful purpose. It provided an opportunity for scientific workers in the fields of actinometry and atmospheric optics to obtain considerable information about what is being done in those fields at many institutions. The delegates decided that it would be desirable to hold similar conferences every year. They also decided to hold other conferences on more specific problems. The desire was expressed that all establishments carrying on work in the field of actinometry and atmospheric optics should send plans and schedules of their work to the Subcommission on Radiation of the Commission on Physics of the Atmosphere of the Academy of Sciences USSR. Members of the conference directed the subcommission to make recommendations on coordinating the related work performed in various establishments. The conference requested that one copy of any new work conducted in actinometry and atmospheric optics be sent to the subcommission.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200960001-7

The conference also charged the subcommission to begin work in 1959 on correcting and unifying the unsatisfactory terminology on actinometry and atmospheric optics used in the Soviet Union. The unsatisfactory state of the development and production of optical equipment and standards was noted at the conference and brought to the attention of the State Planning Committee of the Council of Ministers USSR (GOSPLAN) and the Main Administration of the Hydrometeorological Service USSR (GUGMS).

Correspondence with the subcommission on radiation may be addressed as follows: Leningrad V-164. Universitetskaya naberezhnaya, 7/9. Leningradskiy universitet, Prof K. Ya. Kondrat'yevu; and Moskva G-242. B. Gruzinskaya, 10. Institut fiziki atmosfery AN SSSR, Prof G. V. Rozenbergu. ("Conference on Actionometry and Atmospheric Optics," by V. G. Kastrov and Ye. M. Feygel'son; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 9, Sep 59, pp 1435-1436)

Measurement of Nonstationary Radiation Fields

The relation between particle counting rate and its dispersion is determined for nonstationary fields of radioactive emissions. A field of radioactive emissions is termed nonstationary when the field acting on the detector is a function of time. Such a condition can be caused by either a change in the emission or absorption properties of the medium or a change in the relative position of the emission detector and the emitting object.

The only limitation imposed on the function for the average counting rate on the detector is that it be a discontinuous Poisson process. It is noted that this limitation is satisfactory for geophysical observations in many cases of practical importance.

Formulas are given for calculating the dispersion for characteristic types of nonstationary fields. Methods of choosing a time constant for the recording devices are surveyed also. ("On the Accuracy of Measurements of Nonstationary Fields of Radioactive Emissions," by R. M. Kogan and I. M. Nazarov, Institute of Applied Geophysics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 9, Sep 59, pp 1353-1358)

Distribution of Radioactive Emanations in Atmosphere Derived Theoretically

A theoretical solution of the problem of the vertical distribution of radioactive emanations in the atmosphere is given. The emanating surface is assumed to be homogeneous and a piece-wise approximation is used for the coefficient of turbulence. The solution agrees with data obtained by many investigators.

The relationship between the concentration of radioactive emanations in the ground and the atmosphere is determined theoretically. The dependence of the emanation content of the air on the "exhalation" of emanations from the ground is also established. Satisfactory agreement with experimental data was found in both cases.

It is concluded that these relationships will be of practical value in making rough estimates of the concentration of radioactive emanation in the air on the basis of its exhalation and estimates of the concentration in the ground on the basis of the amount in air close to the ground. ("Vertical Distribution of Radioactive Emanations in the Atmosphere," by S. G. Malakhov, Institute of Applied Geophysics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 9, Sep 59, pp 1344-1352)

IV. SEISMOLOGY

Study on the Excitation of Storm Microseisms

The results of an analysis of microseismic data from Far East seismic stations for 1954-1957 conducted in the Sakhalin Complex Scientific Research Institute, Academy of Sciences USSR, are examined by V. G. Bukhteyev and T. A. Andreyev of the Siberian Branch of the Academy of Sciences USSR. Certain conclusions based on this analysis are made relative to the conditions of excitation of microseismic vibrations.

B. B. Golitsin, as far back as 1912, noticed that the period of microseisms appeared to be almost identical for different points on the globe. On the basis of this, he proposed that the period of a microseism is to some degree determined by the natural oscillations of a certain layer of the Earth. Data gathered by the authors are said to support this assumption.

The Far East seismic stations constantly record regular changes in the periods of microseisms in the course of the development of a microseismic storm: as a rule, the storm begins with oscillations having a relatively short period and then with an increase of amplitudes, the periods increase. With the abatement of the storm, the periods are little changed. Together with the growth of the absolute magnitude of the period in the first half of the microseismic storm, an increase in the proportion of the long-period oscillations in the spectrum of the microseism is observed. Curves of the distribution of microseism periods with the different stages in the development of a storm are depicted. These show that as the storm develops the maximum of recurrence shifts toward the long periods.

The indicated regularity of changes in periods can possibly be explained by the fact that the period of a microseism is determined not only by the period of the perturbing force (sea waves), but also by the natural period of the layer of earth being oscillated.

It is now possible to consider as established that storm microseisms are generated by sea waves. Still not clear, however, is whether the region of microseism excitation lies in the zone of the sea near the shore or whether microseisms are excited in the open sea. The comparison which was made of the intensity of microseisms recorded by the Far East seismic stations with the height of sea waves in the coastal zone of the sea showed no correlation between these values. The maximum amplitude of the microseisms in some cases is observed 6-8 hours earlier than the maximum height of the waves, and sometimes lags by almost 24 hours.

At about 1200 hours on 3 March 1956, in the Kuriles, the amplitude of microseisms decreased to 4 microns, whereas in the coastal zone of the sea, wave disturbance with an intensity of five and a wave height of 3.5 meters was observed. In the afternoon of 13 October 1955, in Petropavlovsk, a decrease in microseism amplitudes from 7 to 3 microns was observed while the intensity of wave disturbance in the coastal waters, at the same time, diminished over-all by one according to the scale. This means that the wave disturbance in the coastal zone of the sea is not the sole, and probably not the main, factor in forming storm microseisms. The principal source of microseisms is found in the open sea.

During the analysis of the recordings of microseismic storms made by the Far East seismic stations, it was found that seasonal changes in the periods of microseisms are characteristic for some stations.

The Magadan station recorded no microseism with a period less than 4 seconds during the winter. The recurrence of short-period microseisms at the Uglegorsk station in winter was only 20 percent, while in the fall, short-period microseisms were frequently (recurrence close to 50 percent) recorded in both of these stations. The seasonal variations mentioned are not characteristic for the Kuril'sk station where the recurrence of short-period microseisms in fall and winter is almost identical. The peculiarities for the Magadan and Uglegorsk stations can be explained by the freezing of the neighboring sea basins. The northern part of the Okhotsk Sea and the Tatarskiy Proliv are covered by ice in the winter and the excitation of microseisms there are impossible. Thus, it is obvious that short-period microseisms ($T < 4$ seconds), which during the fall storms are frequently registered by the Magadan and Uglegorsk stations, are local in origin and are excited in the northern part of the Okhotsk Sea and in the Tatarskiy Proliv.

There are other facts indicating that short-period microseisms are stimulated in the Tatarskiy Proliv. Station Uglegorsk, located on the shore of the strait, sometimes records microseismic storms the beginning of which is characterized by an exceptionally rapid growth of amplitudes. In such cases, it is possible to establish the time of a storm's beginning with an accuracy of up to one hour. It was found that such microseismic storms were registered by the Uglegorsk station in those cases when a cyclone or cold front traveled from the continent and moved over the Tatarskiy Proliv. For example, on 1 April 1956 at 1200 hours Greenwich Time, a cold front began to shift from the mainland into the Tatarskiy Proliv. The seismogram at the Uglegorsk station clearly showed the beginning of a microseismic storm at 1400 hours. Subsequently, as the motion of the cold front moved over the strait, the amplitudes of the microseisms in Uglegorsk diminished while a particularly rapid growth in the amplitudes was observed at the beginning of the storm (the amplitude of the storm had already reached 3 microns at 1600 hours). It was noted that the diffused cyclone, which was located over the Okhotsk Sea for a long time caused no significant strengthening of the intensity of microseisms in Uglegorsk. The 1 April 1956 microseismic storm was caused by the passage of a cold front in the Tatarksiy Proliv. Microseisms excited in the Tatarskiy Proliv have a short period. A storm usually begins with vibrations, the period of which is less than 2 seconds, and during the maximum development of the storm the microseism period rarely exceeds 4 seconds.

The formation of sea waves with a long period and height sufficient to set a layer of Earth of considerable thickness into vibration is not possible in the comparatively narrow and shallow strait. This is why the Tatarskiy Proliv is the region of excitation of short-period waves. ("Excitation of Storm Microseisms," by V. G. Bukhteyev and T. A. Andreyev, Siberian Branch of the Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 10, Oct 59, pp 1510-1512)

V. GRAVIMETRY

Problem of Determining Absolute Value of Gravity

N.P. Grushinskiy and N. B. Sazhina, in examining the problem of determining the absolute force of gravity, make the following points.

Knowledge of the absolute value of the force of gravity is necessary for referring all gravimetric surveys in the world to a single and accurate system and for obtaining correct results of formulas for a normal value of gravity and the shape of the Earth.

At present, there is a lack of coordination in the gravitational systems and surveys of different countries which are based on different initial points and are incompatible with one another. There are three absolute values for gravity which are assumed on the basis of a world gravimetric survey and are based on determinations made in Potsdam, Washington, and London. These three do not represent the true value of gravity.

The Potsdam, Washington, and Teddington determinations were made by use of the reverse pendulum method. The errors inherent at present in this method, even under the best conditions, limit the accuracy of the results by several milligals. This method lost its advantage over the free-fall method of obtaining g when the technique of measuring small time-intervals reached an accuracy of a significant figure of 8. The free-fall method has its own sources of errors, they are, however, principally different from those with pendulum determinations. Both methods give independent results; the second method can, therefore, serve as a control for the first.

Free-fall determinations of gravity are now conducted in several places. In the USSR such work is conducted in the Scientific Research Institute of Metrology by P. A. Agaletskiy, K. N. Yegorov, and A. I. Martsinyak. Two versions of the free-fall method are employed in this work: by a method of a combination of free-fall and restricted fall (I), and by the method of a falling rod in a vacuum (II), and also by observations of triple quartz pendulums. An average weight value of gravity g = 981919.3 ± 0.6 milligals for a VNIIM (All-Union Scientific Research Institute of Metrology point with the coordinates 59 55 06 N, 30 19 35 E, and a height above sea level of 3.5 meters was adopted considering only observational data obtained by the reverse pendulum method. However, according to VNIIM determinations, it is necessary to accept a simple value of all three methods. Then the value g will be g = 981921.2 milligals, or being reduced to the Potsdam system, g = 981264.5 milligals.

Measurements for determining the force of gravity were conducted during 1957 and 1958 by A. C. Thulin, who made motion pictures of a falling metric rod of iridium alloyed with platinum. In setting up the experiment, it is important to stabilize the frequency and duration of the light flashes while photographing. These flashes had a duration of 0.2 microsecond and a repetition rate of 100 to 125 per second.

The results of this experiment are estimated as having an accuracy of ± 1 milligal or somewhat higher. It can be considered one of the best modern determinations of the absolute value of gravity. The most reliable measurement of g made recently is that of Thulin. This coincides with the results obtained at Teddington by Clark and is very close to that obtained by Agaletskiy in Leningrad. The average deviation of g from the Potsdam system, according to all known recent determinations of gravity, beginning with Washington's, is - 12.4 milligals ± 1.6. Thus, for Leningrad, a value obtained as a simple average of three determinations (981,921.2) is accepted. The value of gravity in Potsdam, according to the latest absolute determinations, is 981,261.6 milligals. The abandonment of the Potsdam system for a new system with a value of gravity differing from the former by 13 milligals is favored. Such a transfer has been done before -- the shift from the old Viennese system to the Potsdam. The difference between these systems was 16 milligals. The final and general transition to a new system should await the completion of determinations of the absolute force of gravity now being conducted in several places.

Both the pendulum and free-fall methods are limited, in the sense of increasing their accuracy, by the possibilities of linear measurements. The principal difficulty of the free-fall method is considered to be in the precise plotting of marks of the rod and the origin of longitudinal oscillations which arise in the system and reach a magnitude of 10^{-6}. There is a possibility of applying a scheme of measurements in which these effects will be bypassed. Haubrich, Rose, and Woolard (Trans. Amer. Geophys. Union, Vol 39, No 1, 1958) proposed a principally new modification of the free-fall method completely excluding linear measurements, which are the main source of errors in all cases. The value of g obtained by their method is expressed through the velocity of light. The measurement of length being principally a more difficult operation is completely eliminated and with it vanishes an important source of error.

The last method is extremely promising and it is recommended that it be applied in work for determining the absolute value of gravity in the USSR. Indications have recently appeared in literature on the possibility of applying the free-fall method to transportable high-speed instruments (K. M. Shomandl, West German Patent No 1011153, 27 June 1957). Shomandl, for example, proposes a gravimeter design in which the force of gravity is determined by the interference method of a freely falling body. ("Problem on Determining the Absolute Value of Gravity," by N. P. Grushinskiy and N. B. Sazhina; Moscow, Vestnik Moskovskogo Universiteta, Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, No 2, 1959, pp 61-68)

VI. OCEANOGRAPHY

Vityaz in Java

The Soviet scientific research ship Vityaz arrived in Tandjung Priok, port of Djakarta, Java. The ship will remain in the port until 16 November when it will sail for Perth, Australia. ("Brief Reports"; Moscow, Izvestiya, 13 Nov 59, p 5)

VII. ARCTIC AND ANTARCTIC

Some News on Antarctic Climate

The Main Geophysical Observatory imeni A. I. Voyeykov has summarized the results of studies concerning the heat balance of Anarctica conducted by Soviet geophysicists during three antarctic expeditions.

N. P. Rusin, meteorological division chief of the observatory, who was a member of the first Soviet Continental Antarctic Expedition and at one time chief of the station Pionerskaya, gave the following information:

Antarctica, which has the absolute cold pole (mean annual temperature is minus 55-57 degrees centigrade), is also the region with the largest amount of solar heat on the Earth.

During the summer months, the central regions of Antarctica receive from the sun more than 30,000 calories of heat per square centimeter in one minute. This is 15-20 percent more than at the equator and 50 percent more than at corresponding latitudes in the Arctic. There are no low, dense clouds in the interior of Antarctica; therefore, solar energy is received continuously during the entire polar day.

Because the surface of Antarctica is constantly losing heat (as a result of intense radiation and reflection), its radiation balance during the year is negative. It would seem that the surface of Antarctica should cool off continuously and reach a low temperature. However, this has not been observed. On the contrary, a warming tendency of the climate has been noticed because the loss of radiation heat is compensated by the heat coming from the upper strata of the atmosphere.

Despite the general warming of the antarctic climate, the thickness of the snow cover in interior regions is apparently increasing. It has been observed that the snow cover in the area of Pionerskaya is 20-30 centimeters higher per year. This is another indication of the fact that the level of Antarctica is gradually rising, as though it were growing. In general, scientific estimates show that on an average the level of this continent is raised by several meters during a 100-year period. ("News On The Nature Of Antarctica"; Moscow, Vodnyy Transport, 24 Oct 59)

Conference on Antarctic Meteorology

The largest scientific conference on problems of antarctic meteorology began in Moscow on 26 October 1959. Noted scientists and specialists of the Hydrometeorological Service of the USSR, scientific research institutions of the Academy of Sciences USSR, the Ministry of Maritime Fleet, and higher educational institutions are attending the conference.

Polar specialists will deliver 35 reports at the conference on problems of atmospheric circulation, radiation and heat balance, physical geography of Antarctica, and methods of observation and measurement. Doctor of Geographic Sciences G. Tauber, chief of the aerometeorological detachment of the First Soviet Continental Antarctic Expedition, will give a detailed description of the "glacier winds" blowing off the antarctic continent, according to studies made in the area of Mirnyy.

Prof V. Bugayev, member of the Third Continental Antarctic Expedition, and Candidate of Geographic Sciences Ye. Tolstikov, chief of that expedition, gave a report on the main features of the relief of East Antarctica. Their predecessors on the antarctic continent, O. Krichak and S. Gaygerov, both Candidates of Geographic Sciences, gave information on the atmospheric circulation in the Antarctic and the Southern Hemisphere and on some peculiarities of the circulation and structure of the atmosphere in the Antarctic and Central Arctic. ("Problems of Meteorology in Antarctica"; Moscow, Vodnyy Transport, 27 Oct 59)

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