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PLEASE NOTE

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I. GENERAL

IGY Work in Georgia, Kirghiz, and Tadzhik Republics

The scientific organizations and scientists of the Georgian, Kirghiz, and Tadzhik SSRs will participate in the program of the IGY. The work for each is described in a scientific periodical. The work of the Georgian SSR is described by Academician Ye. K. Kharadze, Academy of Sciences Georgian SSR, and V. V. Kebuladze and A. V. Bukhikashvili, Candidates of Physicomathematical Sciences. K. O. Otorbayev reports on the work of the Kirghiz SSR. P. V. Babadzhanov, Candidate of Physicomathematical Sciences, Stalinabad Astronomical Observatory, reviews the work of the Tadzhik SSR.

The scientific organizations and scientists of Georgia will actively participate in observations according to the program of the IGY. The basic complex of those participating is centered in the Institute of Geophysics and the Abastumani Astrophysical Observatory, Academy of Sciences Georgian SSR, and in the institutes of the Administration of the Hydrological Service. According to the IGY program the work in Georgia will be coordinated by a committee of the Presidium of the Academy of Sciences Georgian SSR under the chairmanship of N. I. Muskhelishvili, president of the academy.

The plan of investigations of the Institute of Geophysics provides for the study of the fields of geomagnetic and geoelectric perturbations and for the investigation of variations of the intensity of cosmic rays. Fixed observations according to these problems are conducted in the Dusheti Geophysical Observatory and in the Tbilisi Cosmic Ray Station.

The study of the field of geomagnetic perturbations in the Dusheti observatory is conducted by means of continuous 24-hour recordings of variations of H, Z, and D elements of the Earth's magnetic field. The registration of variations is accomplished at a feed rate of 20 mm per hour in parallel by magnetographs which are set up in the variation pavilion Continuous 24-hour registration of variations of the east and west components of electrical earth currents are also made parallelly in two electrotelluric devices with feed rates of 20 and 80 mm per hour. Continuous round-the-clock recordings of short-period variations of the vertical components of the geomagnetic field and the east and west components of regional earth electric currents are made using fluxmeter galvanometer devices.

Investigations of variations in the intensity of cosmic rays have been conducted since 1 October in the ionization chamber of the Tbilisi Cosmic Ray Station. Observations with a neutron monitor and a stereoscope telescope will begin very soon.

The working of the problems described presents an opportunity to study the reason for the appearance of the different types of oscillations and perturbations of the Earth's magnetic field, to investigate variations of the intensity of the various components of cosmic rays, and to determine the mutual connection between these and other heliogeophysical phenomena.

Investigations of the photospheric and chromospheric formations on the Sun and the physical parameters of the Earth's upper atmosphere are traditional for the Abastumani observatory. The experience of numerous observation, developed methods, and results obtained from previous operations ensured the fruitful participation of the observatory in fulfilling the IGY program.

A new instrument for solar investigations, a photospheric-chromospheric telescope, was mounted in a specially built tower with a rotating cupola toward the beginning of the IGY. This instrument, together with a spectrohelioscope-heliograph and a small meniscus photoheliograph, provides systematic photospheric-chromospheric service and chromospheric flare patrol. Radioastronomic measurements of solar radiation on a wavelength of 1.5 meters are also conducted.

Works on the study of the properties of the upper atmosphere is based on observations of night sky brightness, photometry of twilight skies, and ozone content measurements. These activities are accomplished by a whole series of spectral and electrophotometric instruments set up, in a specially constructed 14-meter tower, in what are actually laboratories for complex investigations of the upper atmosphere.

A photoelectric photometer made in the observatory, consisting of a bismuth-cesium photomultiplier, a direct-current amplifier feeding the optic, a device for changing the light filters, and a galvanometer, serves to measure the intensity of the basic emmissions of the night sky, oxygen emissions (5,577 and 6,300 A°), and sodium (5,893 A°). Another electrophotometer with an oxide-cesium photomultiplier and a set of light filters is intended for investigating the intensity and spectral composition of the twilight sky. Systematic measurements of the quantity of ozone in the stratosphere, the seasonal variation of its content, and variations of the altitude of the layer are conducted with the aid of a new series photoelectric ozonometer.

Observations and measurements of the coordinates of the artificial earth satellites complete the cycle of work of the Abastumani observatory according to the work of the IGY program.

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In the period of the IGY the workers of the Academy of Sciences Kirghiz SSR must solve a number of important problems of contemporary glaciology in the instance of the glaciation of Central Tien Shan. Work on the study of glaciers is concentrated on the base of the Tien Shan High-Altitude Physiogeographic Station, which is one of the basic points for glaciological observations in the USSR during the IGY. Both fixed and expeditionary investigations are conducted.

The work is directed principally toward the study of the processes of accumulation, transformation, and melting of ice in relation to the heat balance of the surface of the Earth, the explanation of glaciation and climate, the study of the traces of old glaciation and the geological activity of glaciers, and meteorological observations. As a result of these investigations the basic laws of the progress of the present glaciation of the Tien Shan will probably be explained and the direction of the evolution of the glaciation of separate physical-geographic regions of the republic established.

The results of the glaciological investigations, besides their theoretical interest, have a more practical value for explaining the effect of glaciation on the climate and the water regime of rivers and for solving problems connected with hydroelectric power station construction, irrigation, and building construction in soils with permafrost conditions.

In accordance with the program of the IGY, the Stalinabad Astronomical Observatory of the Academy of Sciences Tadzhik SSR will conduct investigations in meteoric astronomy. The investigations are conducted by photographic, radar, and visual methods.

Photographic studies of the altitude, velocity, and brightness of meteors permits determination of the physical parameters of the upper layers of the Earth's atmosphere for altitudes of 60-120 kilometers. In addition, the processing of photographs of meteors gives valuable information on the radiants of meteor showers, their diurnal migration, etc.

Radar observations pose problems of the collection of statistical data on meteor activity in specific time intervals necessary for the evaluation of the relative role of meteors and solar radiation in the ionization of the E layer. A large number of meteors are recorded by the radar apparatus of the observatory.

Visual observations are conducted with the aid of high light-gathering-power binoculars of the "Asembi" type which give information on the drift of meteor trails. These observations, together with photographing, make it possible to judge the direction and velocity of air currents in the upper layers of the atmosphere. The data obtained are confirmed by careful processing. (Moscow, Vestnik Akademii Nauk SSSR, No 3, Mar 58, pp 56-58)

Stalinabad Observatory Completes 25 Years of Service

The Stalinabad Astronomical Observatory has completed 25 years of operation. During this time its workers have conducted a great amount of work on the observation and investigation of meteors, meteoric dust, variable stars, and comets. The observatory's archives contain about 20,000 photographs. These are used by the workers of many of the observatories in the Soviet Union. Tadzhik astronomers have studied the physical properties of more than 1,000 variable stars. N. I. Gur'yev, A. V. Solov'yev, and A. M. Bakharev have discovered three new stars and one comet.

CPYRGHT

The collective of the observatory actively participates in the work of the IGY. L. A. Katasev, Candidate of Physicomathematical Sciences, has obtained important results from studying the upper layers of the atmosphere. P. B. Babadzhanov, Candidate of Physicomathematical Sciences, is investigating the connection between meteors and comets.

The government of the republic has decided to reorganize the observatory into an astrophysics institute. (Moscow, Izvestiya, 27 Apr 58)

CPYRGHT

New Yugoslav Organization Will Study IGY Data

Engr Abdulah Muminagic, secretary of the Yugoslav National Commission for the IGY, has announced that a special organization composed of geophysicists will be founded for the study of data obtained during the IGY. The decision to found the organization was made on 14 March 1958 at a meeting of the Secretariat of the National Commission for the IGY which discussed the aims of the IGY. (Zagreb, Borba [Zagreb edition], 22 Mar 58, p 4)

CPYRGHT

CPYRGHT

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Use of Satellite for Ionosphere Study

An article titled "On a Method of Investigating the Ionosphere With the Aid of an Artificial Satellite of the Earth," by Y. L. Al'pert, does the following:

1. Discusses the disadvantages of vertical rocket launchings to obtain ionosphere data: "Our information on the ionization balance and microprocesses in the ionosphere is very contradictory. Various values given for these processes, for example, the coefficient of recombination and the cross section of photoionization obtained from a treatment of experimental results and theoretical calculations, often differ by as much as 10^2-10^3 and more."

2. Considers a method of investigating the ionosphere with the aid of an artificial satellite moving at a rate of approximately 8 kilometers per second in an elliptical orbit with a perigee in the F2 layer (250-300 km) and apogee at an altitude of approximately 800-900 kilometers ("above the region where the maximum electron concentration of the F2 layer occurs"). For the radio method and the utilization of the Doppler effect, a frequency $f \sim (10^7$-$10^8)$ cps is chosen as most favorable, since the Doppler shift, even in those directions which form an angle $\varphi \sim 80$-85° with the direction of radiation, amounts to values of $\Delta f \sim 100$-150 cps, and may be recorded with great accuracy.

3. Points out that, from an analysis of the results of measurements based on the utilization of the Doppler effect, a number of values for ionosphere parameters can be obtained for a region above the point of observation extending in a horizontal direction for a distance of several hundred kilometers (assuming that each observation lasts 60-90 seconds, during which the satellite flies past at a distance of 250-300 km).

4. States that a direct measurement can be made of the total number of electrons in a column with a cross section of one square centimeter extending from the lower limits of the ionosphere to an altitude z_0 of the satellite in its passage over the point of observation, i.e.,

$$Np\,(z_0) = \int_0^{z_c} N\,dz,$$

and points out also that this method is used in addition to determine the value of the radial velocity r_0 of the satellite in the direction of the observer.

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5. States that, under certain conditions (in an undisturbed ionosphere), the value of electron concentration at the altitude of passing satellite,

$$N_0 = N(z_0),$$

can be determined as an average value of electron concentration in a column several kilometers high.

6. States that, in a number of cases, it is possible to determine the values m_0 and Λ_0, i.e., the dimensions which characterize the fluctuation of electron density and the linear dimensions of nonhomogeneous formations along the flight path of the satellite.

7. Discusses the analysis of the results of measurements for the case where $N = N(z)$, i.e., when the electron concentration depends solely on altitude, and for the case where $N(x,z) = N(z) \left[1 + m \cos \frac{2\pi}{\Lambda} x\right]$,

i.e., where the variability of the ionosphere, caused by slight inhomogeneities varying from dozens to several hundreds of meters in size, are taken into account.

8. Considers certain evaluations of measured dimensions and the accuracy of their determination.

9. States the following conclusions:

"Complete pertinent data cannot be obtained with modern facilities in a single experiment (either directly or indirectly); thus several similar experiments...point the way toward a greater possibility of studying the ionosphere.

"It is evident that, during a period of active disturbance or increased ionization in the ionosphere (for example, of the sporadic layers), it will be hard to obtain, from measurement data, information on all...parameters. The duration of these disturbances usually fluctuates from several minutes to an hour, with the maximum reaching several days, and these disturbances do not take place at the same time over the entire Earth. For this reason, such disturbances scarcely upset the measurements during the total period of flight of the satellite; and, if suitable sources of power are provided, the possibility of producing an observation extending over several weeks' time will be afforded. On the other hand, the data obtained at the time of these disturbances will, when compared with the results of vertical soundings, give new and interesting information on the character and structure of the disturbed ionosphere.

"Naturally, any experiments with satellites, even in the case of the simplest method of measurement, should be precise investigations. The...experiments can be conducted without special technical preparations. Measurement and design problems which arise may be solved with the aid of ordinary radio-engineering equipment." (Uspekhi Fizicheskikh Nauk, Vol 74, No 1, Jan 58, pp 3-14)

Sputnik Contributions to Geodesy

The advent of the sputniks has given man the possibility of conducting observations of the cosmos from the vantage of interplanetary space for the first time. Among the wide horizons opened to science is that which stands before geodesy and the whole complex of science, the study of the shape of the Earth.

A. A. Mikhaylov, Corresponding Member of Academy of Sciences USSR and director of the Main Astronomical Observatory, gives his reviews on this aspect of the use of the sputniks in an article titled "What Will Sputnik Observations Give to Geodesy?"

The orbit of a sputnik, the determined size and angle of inclination to the equator, are fixed beforehand. The elements of the orbit depend on the velocity and direction of the sputnik's launching.

The launching of a satellite into a given orbit is a complex technical problem which requires great accuracy. The satellite's velocity must be maintained within a certain percentage of accuracy, and the error of its launching angle must not exceed 1-1 1/2 degrees.

Soviet scientists, engineers, and designers have successfully overcome all the difficulties of launching sputniks and launched them into orbit within the prescribed limits of accuracy. But this orbit does not remain unchanged. Its change is due to two causes, air drag and the force of gravity.

The resistance of the air plays the role of a unique brake, by which the great axis of the orbit is decreased and its eccentricity is reduced. The orbit, elliptical at first, approaches a circular one, coming closer to the surface of the Earth, and the orbital period decreases.

The braking effect is impossible to calculate beforehand, since the density of the air at these altitudes is not known to scientists. Now that the sputnik reports on the density of the upper layers of the air, the effect of the atmosphere can be discounted and the motion of a sputnik will depend only on the force of gravity, which is not the same for all points of the Earth.

Sputniks can be given different orbits. They can be made to travel along the equator or from pole to pole, or counter to or in the same direction of the Earth's rotation. Each of such sputniks possesses its own advantages and disadvantages.

For geodesy, the most favorable is the polar sputnik. The equatorial sputnik, traveling mainly over the equatorial zone, will give much less information in this respect.

"The selection of the orbits' inclination, 65 degrees, was not accidental. Moved thus, a sputnik spends a maximum of time over the territory of the Soviet Union, which it flies around in all directions, and therefore reports the largest quantity of information on the distribution of gravity in it to us."

"In the future it would be of great interest to launch a sputnik farther from the Earth. If it were caused to move above the Earth's atmosphere (at altitudes of more than 1,000 kilometers), its influence would not be felt and it would be unnecessary to include it in calculations. A so-called "twilight" sputnik which is always visible in the rays of the setting or rising Sun is especially remunerative in like observation. It is easier to observe by optical means, and visual and especially photographic observations are more accurate than radar methods. It is especially important to observe the sputnik at the end of its life when it is nearest of all in its approach to the Earth, and at the time the transmitter batteries run down.

It is wrong to imagine, says Mikhaylov, that several flights of a sputnik around the Earth are sufficient for scientists to know the exact shape of the Earth. Hundreds of measurements, proofs, and new observations are required for this. At present it is important to accumulate as many observations of the true motion of a sputnik as possible. After this, as these data are assembled and carefully worked over, figuratively speaking a new level of science will be achieved and definite conclusions will be made.

However, a great amount of difficult but very interesting work remains to be done in this field. (Znaniye - Sila, No 3, Mar 58, p 35)

Simultaneous Photographs of Sputnik II Made in Czechoslovakia

The observatory of the Institute of Astronomy (Astronomicky ustav) of the Czechoslovak Academy of Sciences in Ondrejov has achieved the most important success to date in observing the earth satellite [Sputnik II]. Z. Ceplech, Candidate of Sciences (Kandidat ved), from the department of interplanetary matter, was successful in photographing the second earth satellite simultaneously from two places on 22 January 1958. The two places are usually used for the photographic observation of meteors.

To take the photograph, two sets of cameras were used concurrently. One set of cameras is located at the observatory in Ondrejov and the other 40 kilometers away in Prcice. While the satellite was passing over, the cameras in Ondrejov were closed for one second every 4 seconds so that the track of the satellite appears broken.

The great importance of the photographs comes from the fact that the position of the two observing stations is precisely known, and consequently it will be possible to define the path of the satellite very exactly. The question, however, arises whether the relative distance of 40 kilometers is not too short, considering the height of the satellite. Therefore, the construction of another station further from Ondrejov is being considered. The fact is that this photographing of the satellite is, from a scientific viewpoint, the most important accomplished in Czechoslovakia. (Prague, Obrana Lidu, 4 Feb 58, p 1)

Chinese Plan 12 Earth Satellite Tracking Stations

Urumchi is one of 12 artificial earth satellite tracking stations being set up in China by the Academia Sinica. On 3 November 1957, 1714 hours Peiping time, the earth satellite [not further identified] passed over T'a-ch'eng at 1850 hours on 3 November and at 1821 hours on 5 November 1957.

Ch'en Te-huang, director of the Mathematics Institute, and Li Chih-hui, director of the Physics Research Institute, both of which are in Sinkiang, gave talks on earth satellites and intercontinental ballistic missiles at Urumchi. (Urumchi, Sinkiang Jih-pao, 5 Nov 57, pp 1, 5)

Soviet Officer Describes Ballistic Rockets

"They (the Soviet satellites) were launched, as is known, by means of multistage ballistic rockets," says Engr-Col K. Malyutin in a newspaper article which, for the most part, is a repetition of Soviet press and periodical information on Soviet satellite achievements.

Malyutin, after making the above statement, continues with the following description of ballistic rockets, but makes no concrete reference to them as being of Soviet type:

A ballistic rocket is a cigar-shaped wingless object with a pointed nose housing the pay load. Farther below are arranged guidance instruments, fuel tank, and power plant. On the lower (first) stage, as in modern aircraft, are external air stabilizers and rudders which control the course of the rocket up to altitudes of 30-40 km.

In airless space, control is effected by means of gas (exhaust) vanes made of high-temperature alloys. Certain ballistic rocket designs substitute a gimbal mounted engine in the place of external stabilizers and vanes.

Rockets traveling at 8,000-9,000 km/hr could attain a skin temperature of 600-700° C owing to air friction and disintegrate as a result of loss of strength. To combat aerodynamic heating, rockets are given a highly finished streamlined form and the head portion is made of high-temperature alloys or, "as it is explained in the press," special compounds of phenol resins with ground asbestos. Sometimes the shell is made of laminated plastics, the layers of which successively burn away during severe aerodynamic heating. For better cooling of the rocket's surface, the liquid cooling (sweating) method is sometimes employed. In this case fuel is forced through minute openings in the shell, and cooling results through evaporation. (Moscow, Sovetskiy Flot, 8 Jan 58)

Slovak Newspaper Writes of Ion Propelled Interplanetary Rockets

A short unsigned article in an issue of the Slovak edition of the daily newspaper of the Revolutionary Trade Union Movement discusses the theory of ion propulsion which would allow space velocities of 200 kilometers per second in interplanetary rockets.

The article is accompanied by a rough sketch of such a rocket, "without any aerodynamic shape, weighing 600 tons and with a pay load of 150 tons." The following key to the drawing is contained in the article, with A at one end, B in the middle, and C, D, and E clustered at the other end of something which looks like a parasol with a flat disk D on top instead of a convex curve.

A -- Atomic reactor (globular with a small disk tangential to topside).

B -- Ion motor (slat shaped, centered on shaft, with longitudinal axis perpendicular to the shaft of parasol shape).

C -- Electric power generator (inverted truncated cone centered on shaft, with base abutting disk D).

D -- Disk-shaped cooling surface (centered on shaft, with diameter perpendicular to shaft axis).

E -- Passenger and crew space (a low-altitude, large-diameter cylinder, centered on the shaft, with its base resting on D). (Bratislava, Praca, 9 Mar 58, p 6)

III. UPPER ATMOSPHERE

Interferometer Studies of Supercorona in Crimea

Investigations of the properties and effects of the supercorona have been conducted at the Crimean Scientific Station of the Physics Institute of the Academy of Sciences USSR. The so-called interference radio reception method was applied, using sea and double antenna interferometers.

According to V. V. Vitkevich, Candidate of Physicomathematical Sciences of the Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR, the Crab Nebula was selected as the source of radio emissions. This source has radio emissions of very high intensity (about one tenth that of the Sun) and angular dimensions in the radio range equal to 6 x 6 angular minutes and is particularly important because of its proximity to the ecliptic.

The direct radioscopy method could not be employed because ordinary radio telescopes have rather poor directivity, receiving radio waves coming in from a large solid angle of about 20 x 20 degrees. Thus, energy from radio emissions from the Sun would accumulate during simultaneous reception of energy from the Crab Nebula. As radio emissions from the Sun vary with time and are at least ten times more intense than radio emissions from the Crab Nebula, it was obvious that the separation of these two sources of radio emissions would be very difficult and could not be accomplished by the direct method.

To divide the radio emissions emanating from the source and the Sun, it was proposed to make use of the condition that, in radio wave range, the angular dimensions of the Crab Nebula are considerably smaller than those of the Sun (equal to 40 angular minutes). It would be possible to "see" a source with comparatively small angular measurements on the background of a source with large angles by so-called interference radio reception.

Observations applying the above principle were conducted in 1951 at the Crimean Scientific Station on 4 meter waves. The radio receiver antenna of the sea interferometer was installed on Kastel' Hill, which is not far from the shores of the Black Sea and at an elevation of 420 m. The width of one lobe of the interferometer picture was 17.6 angular minutes. Daily observations of radio emissions from the Sun during its rise from beyond the sea and also those of the Crab Nebula were made throughout June. Characteristic curves were obtained for the intensity of both pure and interference radio waves.

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On 15 and 16 June, when the Sun approaches the Crab Nebula, observations were disturbed by violent processes on the Sun. Powerful additional emissions caused by sunspots and coming from regions with very small angular dimensions (several minutes) resulted in interferometer registrations of these regions of radiation. However, after the source of radiation had moved about 2 degrees away from the Sun, it was possible to process the results of those measurements for the case when an interference picture of only the Crab Nebula was observed at the time of sunrise, before the Sun had actually risen. Processing of the data showed that the intensity of radio waves from the Crab Nebula, in particular on 18 June and in part on 19 June, was somewhat smaller than on other days.

In attempting to explain the above phenomenon, Vitkevich said, "From one point of view, it could have been the effect of the outermost regions of the solar corona at distances of 12-15 solar radii. At that time it was difficult to consider this assumption as being true, since it could not be considered probable that such distant regions of the solar corona were weakening radio waves with a length of about 4 m.

"Another possible explanation was that the weakening of intensity is caused by ionosphere effects."

To decrease the action of the ionosphere, which strongly affects observations near the horizon, subsequent observations were conducted with a radio interferometer consisting of two antennas joined by a high-frequency cable and connected to one radio receiving set. Such an apparatus performs measurements during the time of culmination and has a multilobed picture of radio reception. Lobe width is determined by the same formula used for a sea interferometer ($\Delta \varphi = \lambda / 2H$, where $\Delta \varphi$ is the angular width of one lobe, H is the antenna height above surface of the sea, and λ is the wavelength) except that in place of H it is necessary to set half the distance between the two antennas.

Such a form of observations which decreased the effect of the ionosphere were conducted at the Crimea station in 1952 and 1953. A similar method was used at Cambridge, England. Both stations established that at a distance of 10-15 solar radii from the photosphere the solar corona definitely caused an essential effect on the propagation of radio waves. The intensity of radio waves from the Crab Nebula begins to decrease when the distance of the source to the Sun is as much as 15 solar radii. As the source approaches the solar corona and the Sun, its intensity decreases more rapidly. Then, as the Sun begins to move away from the source, the intensity of the source increases and acquires its former value.

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Corresponding calculations were conducted to explain the principles in the effects observed. On the basis of a number of considerations it was possible to form the hypothesis that the effect observed is the result neither of the absorptions of radio waves in the outermost regions of the solar corona nor of refraction or diffraction, but is the result of scattering of radio waves by electronic heterogeneities.

To establish the nature of the effect, observations were performed analogous to the former but using two interferometers having different distances between their antennas and therefore different angular widths in their lobe patterns.

Vitkevich resolves the method as follows: "Through simultaneous observations on the same wavelength with two radio interferometers, it was possible to expect one of the following results. First, it could occur that, as the Crab Nebula is covered by the solar corona, the intensity of interference pictures on the two interferometers decreases to an equal degree. Then it is clear that we could come to the conclusion that the effect observed is the result of a decrease in strength of incoming waves. Second, it could prove to be that the degree of decrease of the interference picture is different for the two interferometers: for the large interference base having narrower lobes, the observed effect of decrease in the amplitude of the interference recording will be more prominent than for the interferometer with the smaller distance between its antennas. In this case we would deal not with the decrease in intensity of incoming waves but with increase in size of the source observed. Such an increase of size could be caused by the effect of scattering of radio waves by heterogeneities of ionized gas (more precisely, by electron heterogeneities) found at such great distance from the Sun."

Observations were conducted in 1954 on 5.8 meter waves to confirm the accuracy of one of these assumptions. One apparatus had a distance of 700 meters between its two antennas and the second a distance of 500 meters corresponding to the widths of the interference lobes, 28.5 and 40 angular minutes, respectively. According to data from these two stations it was found that interference of the Crab Nebula was the least on about 7 and 21 June. On 15 June the distance between the center of the Sun and the source was the smallest, and the degree of decrease in the interference picture was so great that it was difficult to distinguish the lobes of the pictures. It was also observed that the apparatus having the greater antenna distance had the larger degree of decrease in the interference picture. It was concluded that the effect observed was the result of scattering of radio waves by electron heterogeneities which exist at great distances from the photosphere. Near the Sun the radio emissions from the source are scattered to a degree which could occur only when its emission measurements become equal to the measurements of the Sun. For this reason interference pictures are not formed.

Vitkevich gives the following picture of the supercorona: "Through the results of investigations up to 1956, it was established that the Sun is surrounded by a supercorona extending out to a distance from several to 20 solar radii.

"It would be important to explain the character of the heterogeneities in the supercorona, their size, and electron density. However, the results of investigations do not make it possible to define these values specifically. Yet we can arbitrarily set values for one of these factors, for example, the measurements of electron heterogeneities, and calculate what kind of electron heterogeneities the heterogenities mentioned would have.

"On the basis of the theory of scattering of radio waves by a heterogeneity, having very large measurements and an index of refraction varying slightly from one, corresponding calculations were performed. Using the two values of 100 km and 1,000 km for the average measurement of heterogeneities, it was calculated that the electron concentrations for these two cases have values that vary slightly and are on the order of several thousand electrons per cubic centimeter for a distance of about 5 solar radii and several hundred for a distance of 15 solar radii.

"The Sun is therefore surrounded by giant clouds of ionized gas extending to distances of more than 10 million kilometers. It is understood that these formations pass uninterruptedly and gradually into the solar corona as it is usually known. It is difficult to assume that such a form of heterogeneity should not be tied in with electron heterogeneities in regions closer to the photosphere. On the other hand, it is very probable that these heterogeneities are the result of the presence of heterogeneities in the more proximate regions of the photosphere, produced by manifestations of solar activity.

"The supercorona of the Sun is that region which organically connects the solar corona and the Zodiacal Light.

"This supercorona affects radio waves emitted by the Sun and received on Earth. This effect is rather little noticeable on waves several meters in length, but with waves 12-15 meters in length and longer it will be considerable. The supercorona, located between those regions where radio waves are generated and the point of their reception (on the Earth) causes the scattering of radio waves emitted by the Sun, lengthens the short duration impulses of radio emissions, and increases the apparant radio diameter of the quiet Sun.

"The discovery of the supercorona and its effect on the processes occurring on the Earth is an important contribution of radio astronomy to the study of the structure of the Sun's outer envelope." (Priroda, No 12, Dec 57, pp 15-20)

Observation of Noctilucent Clouds in the Arctic

The question whether noctilucent clouds can be observed in the Arctic is discussed by S. N. Sredinskiy, of the Minsk Branch of the All-Union Astronomical and Geodetic Society, in an article in a Soviet periodical.

Although there is no doubt as to the possibility of observing such clouds in the Arctic, twilight conditions there have their own distinct peculiarities.

The best conditions for the detection of noctilucent clouds are at twilight when the Sun is 6-18 degrees below the horizon. In the Arctic the prolonged twilight is observed in the spring and autumn, and especially in the winter period when even in the daytime the sun is not far below the horizon. At this time it is also possible to conduct searches for these clouds.

In midsummer, in the period of the polar day, the necessary twilight conditions do not exist, and therefore it is impossible to detect noctilucent clouds by the usual observations.

However, literature does not possess any references to the observation of noctilucent clouds in the Arctic. This can be explained by the fact that such observations generally were not conducted beyond the Arctic Circle. If these noctilucent clouds were observed, they were mistaken for the usual phenomena in these parts, the aurorae. Only a man with exceptional keenness of observation could give a description of the unusual phenomena that would immediately make it clear that he saw noctilucent clouds.

Such an observer was Fridtjof Nansen, who, during his attempt to reach the pole by letting his ship freeze in the ice and drift with it, twice observed these clouds during the winter of 1893. These sightings were made on 2 November and 11 December between 78 and 79 degrees north latitude and 137 and 138 degrees east longitude.

The phenomena which were observed by Nansen, and which he noted in his diary, both times strongly differed from the well-known various forms of aurorae which he also knew well. In this opinion he was supported by his associates.

It is hoped, says Sredinskiy, that this information which he has presented will be of use to observers who are working beyond the Arctic Circle. It is obvious that the observations of noctilucent clouds which will be made during the IGY will be of particular value. (Priroda, No 3, Mar 58, pp 74-75)

IV. OCEANOGRAPHY

Trawling the Greatest of Ocean Depths

The following is a complete translation of an article entitled "Trawling in the Maximum Depths of the World Oceans," by Professor Ya. A. Birshteyn, Moscow State University imeni M. V. Lomonosov, A. I. Savilov, Candidate of Biological Sciences, and G. B. Udintsev, Candidate of Geographical Sciences Institute of Oceanology, Academy of Sciences USSR.

Sailing on its very first voyage under the IGY program, the Vityaz, expeditionary ship of the Institute of Oceanology, Academy of Sciences USSR, conducted several investigations in the Mariana Trench. As is known, the greatest recorded depth in any ocean, 10,863 meters, was measured here in 1951 by the English round-the-world expedition on the ship Challenger. This expedition also established that depths of more than 10,000 meters in the Mariana Trench occupy a narrow belt not more than 4 kilometers wide. The expedition on the Vityaz made additional investigations of the depth and morphology of the trench, and expanded and improved previous findings. It has now been established that the Mariana Trench between 141 51 and 142 15 East longitude has a flat bottom, one to 3 kilometers wide, lying at depths of from 10,000 to 10,900 meters. The maximum depth in this region is 10,960 meters. Depths of more than 10,000 meters were discovered and traced for about 40 kilometers west of the part investigated earlier by the Challenger. Thus it was discovered that in the west, the flat bottom of the trench was split, being separated by a narrow longitudinal rise.

Included in the Vityaz' plan of work was trawling in the maximum depth of the oceans of the world to obtain data on its fauna. Deep-water trawling up to this time had not exceeded 10,210 meters. This was achieved by the Danish expedition on the ship, Gatateya, in the Philippine Trench in 1951 at depths of 10,160 to 10,210 meters. Specific but little bottom fauna was discovered. Similar results were obtained by the Vityaz in trawling the Kurile-Kamchatka trench at depths of 9,950 meters. Procuring such data, but in the much greater depths of the Mariana Trench was of the greatest interest.

The problem was made more difficult by the narrow belt of the flat trench bottom. The direction of the wind was unfavorable and caused the ship to drift at right angles to the trench. During the three attempts which were made to trawl at the maximum depths the bottom, including the deepest part, and the sides were successfully trawled. Samples of the deposition, oozy sediments, fragmental material representing, possibly, rubble from bed rock were obtained. Although the biological results of the trawling were not completely successful, the data obtained was fully indicative of its nature.

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The first trawling, on 15 August 1957, in the lower part of the side of the trench at a depth of 8,700-9,200 meters produced only a large slab of cementlike bottom deposit (silt stone) and fragments of rock material. No life was apparent in the catch.

The second attempt produced nothing as the trawl failed to reach bottom.

The third attempt was conducted using the Vityaz' powerful winch, which operated at a slower speed than that of the trawl winch ordinarily used for deep-water trawling. The entire operation, lowering and raising the trawl together with the trawling itself took considerable time, 12 hours and 40 minutes. During the actual trawling, which lasted one hour, continuous depth soundings were made using a self-recording fathometer. Based on these readings it is possible to state that the trawl moved along the bottom of the trench at depths of from 10,920 meters down to 90,930. During the raising of the trawl it was seen that it contained a considerable quantity of bottom deposition. However, because of the delay in raising the trawl to the deck, the soil in the trawl pocket was washed by the waves and carried away by the water in the form of a muddy cloud. All that remained in the trawl were several clots of clayey sediment. No bottom life was found.

The negative results are interpreted in several ways. The most probable explanation is that in the great depths of the Mariana Trench, including the region of the greatest of ocean depths, bottom life exists, but is very sparse. Because of this, it is necessary to cover a considerably greater bottom area than was done. Concerning the scarcity of life in the great depths of the Mariana Trench, the data obtained by M. Ye. Vinogradov on deep-water plankton, the biomass of which is approximately 100 times less here than in corresponding depths in the Kurile-Kamchatka trench, is cited. It is reasoned that if the deep-water benthos of the Mariana Trench is proportionately as scarce as are the plankton, then the absence of bottom life in the trawl was not surprising, and it is apparent that the bottom area covered was not large enough.

If the negative results of the trawling are accurate, and bottom life is absent at that spot on the bottom of the Mariana Trench where it was trawled, then it is possible to consider that this peculiarity applies only to this trench or only to a given region of the flat bottom, inasmuch as in other ocean trenches (Philippine, Kurile-Kamchatka, Bougainville, etc.) bottom life lives at depths of from 9,000-10,000 meters.

These considerations concerning the possible scarcity or local absence of fauna at the bottom of the Mariana Trench agreed very well with the results of geological investigations made in deep-water ocean trenches by expeditions on the Vityaz and certain other expeditions. The presence of a narrow belt of flat bottom; abutting the steep, broken surface of the trench's sides, must be considered as an indication of the existence of the powerful transfer near the bottom of sedimentary material from the sides to the lower part of the trench. Only as a result of such a transfer can a flat surface of sedimentary material filling the deepest part of the trench originate. The cause of such a transfer of large masses of sedimentary material into a trench must be either by submarine landslides or by streams of suspended materials. In the majority of cases the former was found to be true. The value of flows of suspended materials for filling up low parts of trenches was shown by V. P. Petelin in the materials collected by the Vityaz expedition in the Kurile-Kamchatka and Bougainville Trenches.

Periodically originating depositions on the bottom of deepwater depressions of large masses of sedimentary materials of different sizes (ranging from large boulders down to the finest silt deposits), must cause the burying and destruction of bottom fauna in them, if not throughout the whole of the trenches' bottom, then in a considerable part of it.

An attempt was made to obtain cores of the bottom sedimentation in the Mariana Trench by using soil corers. The corer was successfully lowered to the flat bottom of the trench at a depth of 10,960 meters, but a core was not obtained because the steel opening of the corer was badly crumpled from its impact with rock, and jammed in it was a fragment of solid bedrock. The rock material found on the flat bottom of the trench could have been carried there by a comparatively recent submarine landslide or by a powerful suspensory current, or it could have been the result of discharge of lava and the falling of a volcanic rock. The lack of or the destruction of bottom fauna could also be connected with such volcanic phenomena.

Final solution of the problems which have arisen will require repeated and thorough investigation of the depths of the Mariana Trench. (Priroda, No 3, Mar 58, pp 70-71)

V. ARCTIC AND ANTARCTIC

Aerometeorological Group Makes Flight Over Antarctic

The aerometeorological group headed by V. Belov, Candidate of Physico-mathematical Sciences, recently made a flight over the Antarctic for the purpose of meteorological observations. At an altitude of 4,000 meters the plane began to operate on a vertical cross-section. A. Babkin and T. Lobodin, scientific associates of the aerometeorological detachment, together with V. Belov, took their places at the instruments. The plane began to describe wide circles and to descend in a spiral.

In 48 minutes the plane had descended to 30 meters above the ocean. At this point a regular "platform" for registering meteorological elements in the lower layer of the atmosphere was made. Within 5 minutes, flying close to the ground, the plane passed rapidly over the ice fields which were crossed by many water openings. Then the plane picked up altitude and flew over Mirnyy towards the interior.

From time to time observations were made, analogous to those conducted over the ocean. Such observations, under identical synoptic conditions, enable scientists to obtain precise data on changes in the basic meteorological elements almost simultaneously in two air masses, i.e., the warm air of the ocean and the cold antarctic air of the continent.

On the return flight, the radioman received a radiogram from Ye. Tolstikov, chief of the Antarctic Expedition, instructing the plane to search for the sled-tractor train en route to the station Pionerskaya, for the purpose of establishing radio contact and aiding the oversnow traverse party in correcting their course. This instruction was sent from Mirnyy because for 3 days a heavy magnetic storm had completely disrupted radio communications with almost all antarctic stations, including the tractor train.

After a short while, the plane located the oversnow traverse party and established two-way radio contact. G. Burkhanov, chief of the party, reported that his group had installed an experimental automatic radiometeorological station on one of the mountain passes and gave its coordinates and call signs for transmission to Mirnyy. The train then continued on its way to Pionerskaya. At that time, the plane was also unable to establish radio contact with Mirnyy, because it had entered the zone of severe attenuation of radio waves, which occurred in this region as a result of the continuing magnetic storm. Radio communication with Mirnyy was re-established only at a distance of 150 meters from the base.

The total flight covered about 1,500 kilometers over the ocean and the continental ice. (Moscow, Vodnyy Transport, 19 Apr 58)

Coordinates of Soviet Antarctic Stations

The Soviet stations in Antarctica have the following coordinates and elevations:

		Elevation (meters)
Mirnyy	66-35 S, 93-00 E	--
Pionerskaya	69-44 S, 95-30 E	2,700
Vostok-I (temporary)	72-08 S, 96-35 E	3,290

		Elevation (meters)
Oazis	66-16 S, 100-44 E	--
Komsomol'skaya	74-08 S, 97-17 E	3,200
Vostok	78-27 S, 106-52 E	3,500

(Moscow, Priroda, No 2, Feb 58, p 62)

Sovetskaya	78-24 S, 87-35 E	3,720

(Moscow, Ogonek, No 12, 16 Mar 58, p 20)

Subantarctic Islands Macquarie and Kerguelen

Prof P. V. Ushakov of the Zoological Institute, Academy of Sciences USSR (Leningrad), presents a 6-page article describing the 1956 visit of Ob' to the islands of Macquarie and Kerguelen, including the history, geology, climate, flora and fauna of the islands, in a recent issue of the popular science monthly of the Academy of Sciences USSR. (Moscow, Priroda, No 3, Mar 1958, pp 58-63)

Glaciological Observations in Antarctic

S. Vyalov, Doctor of Technical Sciences, gives a 3-page report on geodetic and glaciological field work conducted by himself and several other glaciologists in the area of Gaussberg and Mount Brown in Antarctica, in a recent issue of the popular science monthly of the Main Administration of Labor Reserves, Council of Ministers USSR. (Moscow, Znaniye-Sila, No 2, Feb 58, pp 1-3)

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