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PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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I. GENERAL

Report on Meeting of Hungarian Geophysicists

A report on the 4-day meeting of the Hungarian Geophysicists Society, held in Budapest and Tihany from 10 to 13 September, given by Tibor Dombai, Kossuth Prize Winner and director of the Hungarian State Lorand Eotvos Geophysical Institute (Magyar Allami Eotvos Lorand Geofizikai Intezet), appeared in the 23 September issue of Magyar Nemzet.

A great improvement in the conference over that of last year was noted. The number of participants from other countries, among whom were geophysicists from the Soviet Union, the People's Republic of China, and the Federal Republic of Germany, was larger and the scope of the reports was broader.

Prof R. Tomaschek of Munich spoke on his gravitational study of wave phenomena. This report was supplemented by one by Szilard Oszlaczky, a department chief of the Lorand Eotvos Geophysical Institute, who described measurements he had made in Hungary under the IGY program. Oszlaczky said that the gravitational forces which cause tides at sea also deform the solid surface of the Earth by as much as one half meter drawing it out into a cigar shape.

A paper by Prof Laszlo Egyed, Kossuth Prize winner, and Lajos Stegena, both department chiefs at the Lorand Eotvos Geophysical Institute was related to Prof Tomaschek's paper. This study provides new proof for the theory presented by Professor Egyed 3-4 years ago, that the Earth is not shrinking but expanding.

Dr G. Richter of Halle University reported on examinations which support the theory that a certain type of earthquake wave originates in the Earth's core.

Prof Ye. F. Savarenskiy, Moscow University seismologist, spoke on marine artificial seismic measurements made during the IGY to determine the thickness and structure of the Earth's crust. Prof E. Vesanen of Helsinki reported on similar work done in Finland.

D. P. Zidarov, a scientific worker in one of the research institutes of the Bulgarian Academy of Sciences revealed a principle for an interesting new analog computer. Zidarov asked for ideas on practical applications of it.

Ku Kung-hsu, chief geophysicist of the Chinese Ministry of Geology and deputy director of the Institute of Geophysics of the Academia Sinica, reported on the methods used in China to discover ore and mineral deposits.

The papers of Viktor Scheffer, chief geophysicist of the Petroleum Industry Trust (Koolajipari Troszt); Laszlo Gacsinai, chief geophysicist of the National Geological Main Directorate (Orszagos Foldtani Foigazgatosay); and Balint Balkay, a scientific worker of the geophysical faculty of the Lorand Eotvos Science University, all received great acclaim. ("Why is the World Sometimes Cigar-Shaped," by Istvan Vig; Budapest, Magyar Nemzet, 23 Sep 58, p 5)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Soviet Scientist Discusses Psychological Problems of Space Flight

A description of the simulated "Moon flight" test recently conducted by the US Air Force appeared in a July issue of the newspaper Sovetskaya Aviatsiya. Prof K. Platonov, Doctor of Medical Sciences, writer of the article, says that it is regretful that this interesting psychological experiment was conducted by the US not for the sake of the progress of peaceful science, but for the solution of purely military problems. "In contrast to the militaristic slant of the work of US scientists in the field of cosmonautics, Soviet investigations of the cosmos and in particular our satellites, solve the most important scientific problems, strengthening man's power over nature." CPYRGHT CPYRGHT

Platonov then turns to a discussion of those characteristics of space flight which will confront the first cosmonauts in their future flights around the world and to other planets.

The main role in the accomplishment of manned interplanetary flights belongs to scientists and engineers---the creators of rockets and future space ships which will be capable of not only going beyond the boundary of the atmosphere but of returning to Earth. However, in the solution of the psychological problems of mans' flight in the cosmos, the important role is played by the investigations of medical workers.

What probems stand before psychological science?

It must study the effect of various factors of cosmic flights (acceleration, weightlessness, isolation, etc.) on the psyche of the astronaut. Work with control instruments and control levers, the creation of conditions for adaptation to weightlessness, and work with rescue methods, must also be investigated. The selection and training of personnel for cosmic flights merits attention.

The specific characteristics of the cosmonaut's actions will manifest themselves in emotional tensions. The manifestation of emotions at different stages of the interplanetary flight will be complex and varied. The feeling of complete dependence of a human on the automatic operation of mechanisms during the launching of the rocket obviously does not ensure a calm state in the cosmonaut inasmuch as he will strive not to lose control, both for his own condition and for reading the instruments.

Radio communication with the Earth will have a great positive psychological effect on the cosmonaut in flight. It is extremely important for science to obtain information from the ship, and the transmission of voice signals from Earth to the ship will be of substantial value.

In addition to cosmonauts, the control instruments and the devices guiding the ship will be the objects of investigations by psychologists.

Difficult movements of a human in conditions of weightlessness will be disrupted. Special investigations in the field of engineering psychology will make it possible to develop, and then to compare various methods of coping with weightlessness and in the plan to estimate their effect on the capability of the cosmonaut. For example, it is necessary to test special magnetic boots, and also the creation of an artificial force of gravity by means of rotating the ship around its own axis.

The results of experiments conducted on high speed elevators which were recently published, showed that a human can well adapt himself to a medium with a changing force of gravity. Training in the control of one's own body in jumping during nose-overs from planes and during delayed parachute jumps can play an important role in this. Swimming underwater can also be considered as one of the methods of training for movements in conditions of weightlessness.

A means of combating "stillness and monotony" will also be of great value. It is uncertain whether it is necessary to draw "the usual doors and windows" on the walls of the cabin as some foreign psychologists recommend, but it will be necessary to provide for changes in sounds and colors, and the illumination of the cabin imitating the change from day to night, etc.

The first cosmonauts will obviously be test pilots who will be able to quickly arrive at correct decisions under the new conditions, possessing varied capabilities and knowledge, and who have a mastery of aviation engineering.

The newest achievements of science and engineering and especially the successful launching of the gigantic Soviet artificial earth satellites render mans cosmic flight all the more tangible. There is no doubt that the difficulties connected with these flights will be successfully overcome by the efforts of scientists with different specialities, among whom will be psychologists. ("Man on the Road to the 'Cosmos," by Prof K. Platonov, Doctor of Medical Sciences; Moscow, Sovetskaya Aviatsiya, 30 Jul 58)

III. UPPER ATMOSPHERE

The Mountain Astronomical Station Near Kislovodsk

The Mountain Astronomical Station of the Main Astronomical Observatory of the Academy of Sciences USSR completed 10 years of operations in autumn of this year. The station was created for observations of the solar corona during noneclipse periods.

The station is located 30 kilometers from Kislovodsk on one of the highest summits of a mountain range, at an altitude of 2,130 meters. The plane of the summit and the absence of turbulence aids in obtaining good pictures.

Although the principal task of the station is the development and the conduction of systematic observations of the solar corona in noneclipse periods, it also has instruments for the observation of conditions in the deeper layers of the solar atmosphere, the chromosphere, and the photosphere. The reason for this is that the active processes arising in the Sun's atmosphere include all the layers, and for their investigation, it is necessary to study the spatial distribution of the physical characteristics and changes of this distribution with time. In addition to the coronagraph, the station operates a photoheliograph, a chromosphere telescope, a large diffraction spectrograph fed by a horizontal solar apparatus, and a radio interferometer operating on a 1.7-meter wave length. There is a laboratory equipped with instruments for geometric and photometric measurements.

All equipment works as a unified complex. The obtained materials supplement one another and give an all-around presentation of the processes developing on the Sun.

Part of the equipment was built by forces of associates of the Main Astronomical Observatory in Pulkovo and in the station itself. The photo-heliograph, the chromosphere telescope, and the large diffraction spectrograph were built under the supervision of P. V. Dobychin. The majority of optical items were made in the optical shops of the Pulkovo Observatory under the supervision of V. G. Shreyber. The diffraction gratings used in the spectrograph, which was connected to the coronograph, and the large spectrograph were of the F. M. Gerasimov type. For observations in monochromatic light type A. B. Gil'barg (in the coronagraph) and S. B. Ioffe (in the chromosphere telescope) type interference-polarization filters were used.

In the organization of the work special attention was given to seeing to it that the daily program of investigations is fulfilled not only on a high level of accuracy but also as rapidly as possible. It is possible to observe the solar corona only in exceptionally favorable conditions. The experience of past years has shown that there are considerably more favorable days here than in any other similar station in Europe or Asia. Especially of great value is the fact that the majority of clear days here occurs in autumn, when the possibility of observations in the majority of observatories is greatly decreased. In addition to this, the maximum clear weather falls in the morning, when the images are especially quiet.

Continuous observations are of great value. Therefore they are conducted by all Soviet observatories, and in this way gaps in the observations caused by poor weather and the approach of night are filled. The compilation of a single complete observation series is only possible with the strict agreement of the methods of observations and the processing of their results. The general supervision of these operations (Sun Service) is carried out by the Commission for the Investigation of the Sun, Academy of Sciences USSR. The station took a leading part in the system of the Sun Service, the importance of which greatly increased in connection with the IGY, since the processes originating in the Earth's atmosphere depend to a considerable degree (and in the upper layers, as a whole) on the state of solar activity.

The program of work of the Mountain Station also includes systematic observations for spots, faculae, flocculi in hydrogen and calcium rays, the magnetic fields of spots, filaments, protuberances and the distribution of the intensity of illumination in the corona around the Sun in the spectral lines 5,303, 5,964, 6,374, 10,747, and 10,798 Å, and radio emissions of the corona on a wave length of 1.7 meters.

Special observations for investigating the physical state of the corona led to the discovery in 1954 that at certain moments, helium line luminescence can be observed in the corona. Later these observations were confirmed by other observatories. A number of facts were gathered by which can be considered the possible existence of matter in greatly differing physical states in the corona. The further study of these phenomena being conducted by the station is of great interest.

Observations of the infrared coronal lines 10,747, and 10,798 Å, with the aid of an electron-optical transducer joined to a spectrograph of a noneclipse corona were begun in collaboration with the State Astronomical Institute imeni P. K. Shternberg. Systematic measurements of the magnetic fields of sunspots on the large diffraction spectrograph were set up jointly with the Division of the Physics of the Sun, Pulkovo Observatory, and undertaken jointly with the Division of Radio Astronomy of the same observatory were systematic observations of the radio emission of the solar corona on a wave length of 1.7 meters, with the aid of a radio interferometer.

At the station, continuous practical training of students in the highest courses of the universities of Moscow, Leningrad, Kiev, and L'vov is conducted, and here the qualifications of associates from different observatories not only in the USSR but also in China, Rumania, Hungary, and Czechoslovakia are raised. ("In the Mountain Astronomical Station Near Kislovodsk," by M. N. Gnevyshev; Moscow, Vestnik Akademii Nauk SSR, No 8, 1958, pp 107-109)

Mg II Emission Lines in Solar Spectrum Measured by Soviets

Photographs of the ultra violet spectrum of the Sun obtained by spectrographs mounted in rockets showed an emission reversal in the middle of the strong fraunhofer absorption lines of Mg II, λ 2795.5 and λ 2802.7 Å. The luminescence of the Mg II resonance doublet is a unique case when the indicated emission lines are observed in the solar spectrum if the weakly expressed emissions in the H and K lines of CaII are not considered. The investigation of Mg II emission, especially the study of contour lines, is of great interest in solar physics.

Certain spectrograms were selected and processed by G. S. Ivanov-Kholodnyy. Mg II emission lines were obtained and identified. It was shown that the intensity of emission lines does not depend on the Sun's activity and is equal to 1.05 and 0.75 microwatts per millimeter squared for lines with a wave length of λ 2795.5 and λ 2802.7 Å correspondingly.

Half width lines $\lambda\Delta$ 0.5-0.6 Å. Emission lines are formed in the chromosphere in a layer with an optical thickness of $\sim$4. The effect of self absorption was calculated, the number of Mg II atoms on the basis of the condition $N(3S) = 9 \times 10^{13} / cm^2$ was found, the perturbation temperature T_B=5,300 degrees was determined, and the density of hydrogen atoms in the chromosphere was evaluated. ("Spectrophotometric Measurement of Mg II Emission Lines in the Solar Spectrum," by G. S. Ivanov-Kholodnyy; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 9, Sep 58, pp 1105-1110)

IV. SEISMOLOGY

Soviet Studies on Tsunami

The problem of tsunami is a comparatively new one for the Academy of Sciences USSR. It arose in connection with the disastrous occurrence of two such gigantic waves on the Kurile-Kamchatka shore on the night of 4-5 November 1952. The strong earthquake from which they resulted had its focus east of Kamchatka in the Pacific Ocean. The amplitude of its elastic oscillations recorded in Moscow was 2 millimeters. The earthquake itself caused no great damage on land but after 20 minutes in the vicinity of the epicenter, and later in the majority of shore points, several gigantic waves struck. The second wave was especially strong, in a great number of points reaching a height of 20 meters. On the Kurile-Kamchatka shore, the wave averaged 7-8 meters over a distance of 1,000 kilometers. The wave swept far inland, at several places for a distance of more than one kilometer. A number of populated points, were damaged.

The process of earthquake origin conformable to the Kurile-Kamchatka arc can be reduced to this, that parts of the Earth with a thickness of possibly a hundred kilometers, to the west of the Kurile depression undergo a geologically slow upheaval and to the east, a sinkage. In a limited zone the first experiences an increasing compression and the second, a stretching. This process episodically completes faults with an extent of tens and even hundreds of kilometers. Thus earthquakes originate. Sometimes a fault is not localized in the depths of the Earth but reaches its surface on land or at the bottom of the ocean. Faults are then formed on the surface; their amplitude can reach 10 meters. This occurs in the Kurile depression, where the foci of earthquakes are not deep, in contrast to the western part, where the depths of the foci reach 600-700 kilometers and the earthquakes do not cause surface damage.

The speed of the formation of faults is very great (it can exceed the speed of sound in water) and therefore a rapid change of volume occurs in the ocean. This disturbance reaches the surface of the water and causes ordinary but very long waves.

Tsunami waves in the open sea have a length of over 100 kilometers, a period of more than 10 minutes, and can even be unnoticed by ships. Their speeds depend on the depths, and is about 0.2 meters per second. The velocity of the wave increases as it approaches shallow water. It can be focussed and scattered depending on the influence of the bottom relief. Approaching the shore, the waves are deformed, the steepness of their forward slope increases sharply, and the waves are transformed into a wall of water.

Elastic seismic waves travel faster and leave the tsunami behind. The minimum lead time consists of about 10-15 minutes for conditions in the USSR. Consequently observations of seismic waves, being forerunners of tsunami, can serve for announcements of danger.

In the USSR since October 1956, the duty of tsunami has rested on members of the GUGMS (Main Administration of the Hydrometeorological Service) and the fulfillment of seismic observations and the determination of epicenters, on the Academy of Sciences USSR (Sakhalinsk Complex Scientific Research Institute). It was decided to build the first GUGMS tsunami warning stations in Petropavlovsk, Yuzhno-Sakhalansk and Kuril'sk. The Institute of the Physics of the Earth was commissioned to develop particularly high-speed seismic apparatus with which the location of the epicenters of tsunami-forming earthquakes could be determined in a few minutes.

The second no less important problem entrusted to the Academy of Sciences USSR was the setting up of a system of regioning zones according to the danger from tsunami. This extremely important work for the rational mastering of the shores of the islands of Kamchatka and the Kuriles was conducted by the Institute of the Physics of the Earth, the Marine Hydrophysical Institute, the Institute of Oceanology and the Sakhalinsk Scientific Research Institute. The role of the latter remains especially important in the seismic service. The coordination and supervision of all the operations was performed by the Council on Seismology.

The first version of the proposed scheme has been compiled at present. As a result of the generalization of seismological, geomorphological, and oceanological data, the most probable zones of tsunami-forming earthquakes were determined, the shore regions for varying degrees of possible flooding by the tsunami shown, and the regions where waves increase were established.

These generalities are necessary but they are inadequate, and to determine the degree of danger threatening specific points, each case requires a refinement of the data in relation to the local relief conditions of the coastal belt, the shore outline and the economic considerations.

A special apparatus for the rapid determination of the location of earthquakes epicenters was developed by the Institute of the Physics of the Earth. Three types of instruments are used in it. An azimuthgraph is included, consisting of a pendulum with two degrees of freedom, which marks the first movement at the moment of the arrival of the longitudinal wave on a blackened plate. This movement, as is known, occurs in the direction of the epicenter. A vertical seismograph with luminophor storage recording the fluctuations serves for a well-defined determination of the direction. After recording the first longitudinal wave, the automatic seismograph lowers the plate with the recording and switches on a light projector with the aid of which the azimuthal direction to the epicenter is determined. A separate seismograph registers the arrival times of longitudinal and transverse waves. The distance to the epicenter is determined according to these.

Thus the possibility is created for very rapidly determining the location of earthquake epicenters according to the data of even one station (either on the ocean or on land) and also to evaluate their intensities. Calculations and instructions for determining the force of earthquakes from which considerable tsunami can appear will be completed in the near future by the Sakhalin Institute of the Physics of the Earth.

The results of the first stage of the work are inadequate. The scheme of regioning the danger of tsunami is much too general. More accurate data on the coastal relief, the shore structure, a more detailed study of the routes of wave phenomena and previous tsunami, and the firmness of recent depositions are necessary for its greater detail. These blanks in the information can be filled by expeditionary investigations on specialized ships.

At present, it is impossible on the basis of seismic data to determine whether an earthquake is a tsunami-forming one or not. It must be possible to effect an explanation of whether the earthquake's epicenter falls in the "tsunamigenic" zone or, to a sufficient degree, to determine whether it is strong enough for a considerable tsunami. The physical processes of elastic oscillations of the Earth during faulting at the surface and considerable wave pressures in water must have special characteristics, and a knowledge of these is necessary.

Hydroacoustical observations which will indicate the wave pressures generated by tsunami are also very important. Since sound waves are propagated rapidly they can serve as a second indication of tsunami. Tide guage observations are of great value both for detecting rapid backsweeps during false tsunami, which frequently cause strong ones, for seeking seismic indications of tsunami and the investigation of the phenomenon itself. ("The Study of Tsunami," by Ye. F. Savarenskiy, Doctor of Physicomathematical Sciences; Moscow, Vestnik Akademii Nauk SSSR, No 9, Sep 58, pp 11-15).

V. ARCTIC AND ANTARCTIC

Antarctic Activities in October

During the first half of October, the weather in the Soviet expedition area of Antarctica was unfavorable for tractor operations. The first train from Mirnyy to Pionerskaya traveled during a continuous purga and with lack of visibility. The temperature dropped to minus 40-50 degrees Centigrade. The "Pingvin" oversnow vehicles and tractors had difficulty in pulling the heavily laden sledges.

Large sastrugi, reaching heights of 1.5 to 2 meters, were encountered frequently along the way. The vehicles skidded from time to time, and it was necessary to pull out one of the sledges by coupling together two or three tractors. However, the train reached the station Pionerskaya safely. From here, four "Pingvin" vehicles proceeded farther south, and one "Pingvin" vehicle with four tractors returned to Mirnyy. The blizzard continued, and the course had to be determined by instruments.

At the same time, two truck-tractors with sledges left Mirnyy. The sledges were taken to the 75th kilometer from Mirnyy. The reason for this is that the first few kilometers of the route into the interior of Antarctica pass over a very steep ascent. To facilitate the ascent of the train up the mountain, it was decided to dispatch several sledges ahead.

The members of both traverse parties returned to Mirnyy after overcoming great difficulties on the way.

On 23 October, the main component of the train headed for the interior left Mirnyy. At the station Komsomol'skaya, the train will meet with the "Pingvin" vehicles, which arrived there earlier. At this point, the freight and the vehicles will be redistributed over two trains. The principal train will travel by a planned route to Sovetskaya and from there, in the direction of the pole of relative inaccessibility.

The second train from Komsomol'skaya will deliver about 50 tons of various freight to the station Vostok for the work of the new staff.

At the invitation of US scientists who had visited Mirnyy in January 1958, a Polar Aviation Il-12 transport plane flew out from Mirnyy on 24 October, carrying a group of Soviet scientists on a visit to the US station McMurdo. The plane was piloted by V. M. Perov and carried aboard, in addition to the expedition chief, the leaders of the aerometeorological detachment, V. A. Bugayev and biologist V. M. Makushok. The plane made a nonstop flight to the McMurdo base. The course of the plane passed over the interior station Sovetskaya.

After 9 hours 20 minutes, the Il-12 reached the South Pole. It circled the pole and headed for the Ross Sea, passing over the Beardmore Glacier. On 25 October, at 0050 Moscow time, the plane arrived safely at the US base McMurdo. The transantarctic flight from the coast of the Indian Ocean to the Ross Sea, a distance of over 4,000 kilometers, was made in about 13 hours 50 minutes.

During the flight, a survey was made from the air of the route to be taken by the sled-tractor train, traveling in the direction of the pole of relative inaccessibility.

At McMurdo, the Soviet polar scientists will become acquainted with the work done by the US scientists and will then return to Mirnyy by plane. "Over the South Pole," by Ye. Tolstikov, chief of Soviet Antarctic Expedition (report by radio); Moscow, Pravda, 26 Oct 58)

Astronomical Determinations in Antarctica

A large part of the program for the exploration of Antarctica during the IGY period is devoted to astronomical determinations. In the area studied by the Soviet Antarctic Expedition, the boundaries of the continent had formerly been determined only roughly; many important geographic objects, both on Soviet and foreign small-scale sea and land maps of Antarctica, were incorrectly represented or not mapped at all. Therefore, together with a study of the geological-geographical and geophysical peculiarities of these objects, it was necessary to determine their location by astronomical methods.

This work in Antarctica presented great difficulties. There was no experience in work of this kind in the Southern Hemisphere, especially in regions of the Far South; there were no available working ephemerides for observations of latitude and time and no special tables for their calculation.

The physical and geographical conditions of Antarctica, i.e., low temperatures and strong, almost continuous winds, were not favorable to astronomical work. The heavy ice sheet, the absolute elevation of the continent, the very low atmospheric pressure, and the heavy snowstorms, all tend to complicate working conditions. In the summer, solar radiation impedes the work, and there are many other complications.

The determination of time by the Soviet expedition was done by the zinger method, and the determination of latitude, by measuring the zenith distances of southern and northern stars, with one circle of the instrument. These methods were chosen because in using them, it is not necessary to have particular azimuth stability of the instrument and therefore it is possible to make observations from moving glaciers.

Before leaving for the Antarctic, working ephemerides of zinger pairs for latitudes of the Southern Hemisphere from minus 64 to minus 72 degrees were compiled and, in addition to the Astronomical Calendar, a list of visible locations of 86 stars to be included in these pairs was set up. The selection of zinger pairs was made from a specially compiled star map of the Southern Hemisphere. For the mean latitude, equaling minus 68 degrees, 247 pairs were selected, which were completely adequate for the normal program of observations during a 24-hour period, i.e., they made it possible to observe not less than eight pairs during a 2-hour interval. The pairs were compiled mainly from stars of the third magnitude.

The calculation of ephemerides and visible locations of 86 stars, supplementary to the Astronomical Calendar, was done by the Institute of Theoretical Astronomy of the Academy of Sciences USSR.

The working ephemerides of 241 pairs of stars (out of 247) were calculated for the period 1960.0. The time interval between observations of stars in a pair was taken to equal 5 minutes.

The processing of astronomical observations conducted in the Southern Hemisphere was done according to the same equations and rules as in the Northern Hemisphere.

In addition to the above-mentioned working aids, the astronomical detachment had tables of the elevations and azimuths for 12 bright stars of the Southern Hemisphere. There were also analogous British tables of elevations and azimuths for 15 bright stars of the Southern Hemisphere.

The astronomical detachment had two complete sets of tools, instruments, and equipment. The following instruments were used for observations in Antarctica: 5-second astronomical theodolites star chronometers (one contact and one half), an aneroid barometer (for altitudes up to 5,000 meters), a "Geodezist" radio receiver, an optical theodolite, mercury barometers of the Blokhin system, maximum and minimum thermometers for low temperatures (to minus 80 degrees Centigrade), a mobile radio station, magnetic instruments, special heaters for chronometers and mercury barometers, lighting equipment, an astronomical tent-pavilion, an ice drill, etc. The theodolites and chronometers were lubricated with a special compound which does not freeze at temperatures to minus 60 degrees Centigrade and tested in a refrigeration chamber. This assured faultless operation of the instruments at low temperatures in Antarctica.

The astronomical detachment arrived in Antarctica early in January i.e., during the antarctic mid-summer. The high-precision astronomical determinations were to be made first of all in areas of major importance for geological-geographical and geophysical research. Such areas included mainly the ice-free regions, i.e., so-called oases, individual islands and cliffs emerging to the surface. Usually such areas are found near the coast. However, in the opinion of some scientists, ice-free areas constitute only 0.02 percent of the total area of the continent.

It was planned to determine two points on the borders of Queen Mary Land, Knox Coast, and the Shackleton Ice Shelf, and two points on the West Ice Shelf. The region where the first two points were located is 300 kilometers east of Mirnyy. In this area the Denman and Scott glaciers join together, and there are outcrops of bedrock in the form of rocky islands, rising above the glacier surface from several meters to 100 and more meters in height.

The astronomical points were distributed in such a way as to serve simultaneously as an elevation bench mark for aerial photography. The outcrops of bedrock, surrounded by glaciers, can be recognized easily on the aerial photographs.

The scientists were transported into the interior by AN-2 plane. Observations begun at the end of January at a point on David Island, at the south edge of the Shackleton Ice Shelf.

The work on Mount Strathcona and at the last point, on West Ice Shelf, was performed under extremely difficult conditions. Mount Strathcona is in the upper portion of the Denman and Scott glaciers, 150 kilometers south of the coast, at an elevation of about 2,000 meters above sea level. These are the most southern outcrops of bedrock on the meridian of David Island.

The observations conducted at this point were made exceedingly difficult because of a heavy blizzard and the fact that the atmospheric pressure on that particular day was almost 200 millimeters below normal. The scientists were forced to pause after every 50 steps on their ascent to the summit and to rest for at least 15-20 minutes.

The observations at this point were completed during one night. Next morning the wind died down completely and a heavy snowfall began. During 8 hours, 123 centimeters of snow fell. By night, a strong wind began to blow again, the whole mass of fallen snow was once more blown into the air, and a violent blizzard continued for several days.

The only spot suitable as a landing strip for a ski plane was covered during those days with masses of loose snow; therefore it was necessary, in leaving, to abandon part of the things belonging to the detachment, except the instruments. To lighten the weight of the plane, it was even necessary to dump some of the gasoline.

The longitudes of points, as a rule, were determined according to program "A" from observations of 5-8 Zinger pairs at 2-hour intervals. Rhythmic time signals were received from radio stations in Moscow, Tashkent, Irkutsk, Shanghai, and Canberra. The audibility of signals was very good.

In observing latitudes by southern and northern stars with one instrument circle, six sightings were made of each star. At some points for example Mount Strathcona, the latitudes were determined by near-zenith stars, which were observed with two positions of the circle (four sightings of each). The azimuths of terrestrial objects at all points were determined by the Sun, in three stages. The final coordinates of points were received out of three to five determinations of longitude and four to eight determinations of latitude.

Special attention was given to the securing of points, in view of the fact that in the wastelands of Antarctica these points will serve for many years as the only witness to the gradually occurring changes in the regime of the ice cover. The problem was to make solid, permanent markers out of light materials, which would be easily transportable by plane. The centers of the points consisted of tanks which had been used for heating gas (weighing 76 kilograms each), which were placed in deep rock fissures. Next to the center a 3-meter duralumin pipe with a diameter of 3 inches was placed. The tank and the pipe were set in the crack at a depth of not less than 1-1.5 meters and covered with large stones. A Duralumin plate was screwed to the upper part of the pipe bearing the engraved inscription "AP No.....

KAE AN SSSR

1957"

[Probably "Astronomical Point No. ......, Complex Antarctic Expedition of the Academy of Sciences USSR]

A solid mound of rocks was piled up above the center and a trihedral pyramid of six bamboo poles was erected, the ends of which were secured in the rock cracks and covered with stones. It may be assumed that the astronomical points, secured in this way, will be preserved for many years in these regions, where the temperatures do not rise above freezing point.

The azimuthal signs were secured in the same manner, but without pyramids. In this case, a glass container was used for the center. The plates attached to the azimuthal signs bore engraved inscriptions with the number of the astronomical point and of the azimuthal sign, as well as the year it was set up.

A network of microtriangulation was developed around some of the astronomical points, for example on David Island. The points and azimuthal signs at the site of operation of the detachment were identified by aerial photographs and were firmly attached.

At all points the scientific workers collected samples of various types of rocks, moss and lichen, prepared descriptions of the locality, and conducted around-the-clock meteorological observations and magnetic determinations simultaneously with the central observatory. Results of the observations were transmitted twice daily by radio to Mirnyy. These data were used, mostly, in compiling weather forecasts for aviation. The altitudes of astronomical points were based on data for pressure measurements.

The working coordinates of the points were computed locally. In deducing the longitudes, corrections were taken into consideration for the speed of propagation of electromagnetic waves. For Antarctica these corrections vary between $0^s.04$ (Tashkent) and $0^s.07$ (Irkutsk).

In addition to high-precision astronomical work in Antarctica, determinations were made (with a precision of $\pm$ 0'.1) of the geographic coordinates of a number of points: Drygalski Island, coast of Depot Bay, Bunger Oasis, Greerson archipelago, and the permanently operating scientific stations Pionerskaya, Komsomol'skaya, Vostok, and Sovetskaya. For these determinations were used methods of approximation to measure the zenith distances of the Sun and observations of aeronavigational stars according to the Somner method.

Astronomical determinations in Antarctica, conducted by the Soviet expedition, constitute a very important part of the extensive research on the Sixth Continent, planned by the IGY program. The astronomical points made it possible to correct or to determine anew the locations of many geographical objects. For example, it was determined that the longitude of Gaussberg, formerly explored by the German Antarctic Expedition of E. Drygalski in 1901-1903, was off by 7 miles the latitude of Mount Strathcona was incorrectly placed by 29 miles, the coastline of the continent in the area of the Shackleton Ice Shelf was placed too far south by 30 miles, etc. The astronomical points determined by the Soviet Expedition will help to compile a current map of Antarctica. ("Astronomical Determinations on the Continent of Antarctica During the IGY Period," by V. Kh. Galeyev; Moscow, Geodeziya i Kartografiya, No 8, Aug 58, pp 22-31)

Second Sled Train Leaves Mirnyy

The second sled-tractor train left Mirnyy on 23 October for the pole of relative inaccessability. ("From Every Corner of the Country"; Moscow Izvestiya, 25 Oct 58)

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