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PLEASE NOTE

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Soviet Press Coverage of Sputnik III Launching

A large number of articles has appeared in the Soviet press in the wake of the launching of the third Soviet artificial earth satellite, Sputnik III.

A review of those articles which appeared in the newspapers Pravda and Izvestiya reveals that the majority adds little to the information first released at the time Sputnik III was placed in orbit. A few deal with some particular feature of the satellite or the fields of investigation concerned. Some are written by leading scientists of Soviet academies and scientific institutions. Wide coverage is given to foreign press comments which reflect Soviet superiority in both scientific and economic fields, while other articles strongly re-echo this theme.

Academician L. I. Sedov, in discussing Sputnik III, referred to it as the "flying cosmic laboratory" which is an historic beacon in man's progress and on whose experience of building and launching will be based the solution of the problems in the next stage of cosmic flights. He foresaw flights to Mars as a reality in the next 20 years. Sedov stated that for the solution of the great problems of astronautics, the cooperation of the scientists of all countries is of great value.

A. Mikhaylov, corresponding member of the Academy of Sciences USSR, in addition to praising the achievements of Soviet scientists, declared that the Main Astronomical Observatory of the Academy of Sciences USSR at Pulkovo is engaged in observations of Sputnik III.

Prof Ye. K. Fedorov, Corresponding Member of the Academy of Sciences USSR, at a press conference held by the State Committee for Cultural Exchange With Foreign Countries remarked that solar batteries will serve as the main source of energy in the future in interplanetary flights. He stated that the life of Sputnik III will exceed that of Sputnik II. On the problem of returning satellites to Earth, Prof Federov indicated that this is being investigated in the USSR at present. He stated, "The problem can be solved in principle, but up to now has not been solved."

A. Shternfel'd, winner of the International Incentive Award for Astronautics, presented a comparison of Soviet and American US satellites from the viewpoint of the energy which they possess after their placement in orbit. (The energy required for launching is considerably greater.) To place an artificial satellite in orbit, two conditions must be fulfilled: raising the satellite to a given altitude and imparting to it a velocity which will enable it to rotate around the Earth. Consequently, the mechanical energy which a satellite possesses in flight is equal to the sum of the work expended in its raising and the energy of its motion. For a more precise calculation, it is necessary to take into consideration that, owing to its nature, the force of gravity decreases with altitude, and the energy with which it is necessary to raise the satellite to its orbit is not proportional to the altitude, as this is calculated in calculating the "terrestrial" problem. The other circumstance which it is necessary to keep in mind is that the ellipticity of the orbits of satellites, on the strength of which the altitude of their flights changes, can also be calculated.

If the full mechanical energy of Sputnik I is conditionally taken as 100 units, then the energy of the Sputnik II will be 633 units, and the third, 1,671 units. In comparison, the total mechanical energy of the US satellites will be as follows: Explorer I and II (the first and third US satellites) will be expressed as 18.2 units, while Vanguard (the second) will be only 2.1 units.

To give a clearer representation of the absolute magnitude of the energies compared, Shternfel'd explained that Sputnik I had an energy equal to that of ten trains, each weighing 1,150 tons, moving at a speed of 80 kilometers per hour.

Among the many instruments carried by Sputnik III were solar batteries, which, in addition to chemical batteries, supplied power for the transmitting apparatus. An interview with M. S. Sominskiy, Candidate of Physicomathematical Sciences, director of the Institute of Semiconductors of the Academy of Sciences USSR, gave a short account of the efforts to devise a way to convert solar energy into electrical energy in the USSR and other countries and a description of a simple solar battery.

A. Kalashnikov, vice-president of the International Association of Geomagnetism and Aeronomy, in an article entitled "The Satellite and the Problems of Terrestrial Magnetism," gave a general description of the Earth's magnetic field, the problems faced by scientists in the study of the geomagnetic field and the aeronomical processes taking place in the ionosphere, and the use of satellites in these investigations. Sputnik III, equipped with magnetometers, will make it possible to measure the intensity of the geomagnetic field, to obtain information concerning the structure of the upper parts of the geomagnetic field and to ascertain the distribution of electrical currents in the ionsphere and the upper atmosphere.

In discussing the study of cosmic radiation with the use of sputniks, L. Kurnosova, and M. Fradkin, Candidates of Physicomathematical Sciences, observed that this was first done using Sputnik II. Two cosmic ray counters which were installed in it made it possible to measure the full flow of cosmic rays at different altitudes and over different parts of the Earth. The basic aim of these experiments was to determine how the flow of these rays differed one from the other in relation to the geographic latitude and also how their flow changed with time. That is to investigate the so-called variations of the intensity of cosmic radiation.

This study of the distribution of the intensity of cosmic rays all over the Earth which was conducted by the Sputnik II was only the beginning of wide investigations of the structure of the Earth's magnetic field. Repeated careful measurements using satellites are required to accumulate data permitting strict and dependable scientific conclusions to be made.

One of the problems being pursued by Sputnik III is the continuation of the investigations of the intensity of cosmic rays. Sputnik III is equipped also with the means to register high-energy photons and heavy nuclei. The authors said that the reason for the latter measurements is the investigation of the theory proposed by scientists that the Sun, in addition to heavy corpuscular flows and cosmic rays, emits, from time to time, hard electromagnetic radiation, otherwise called high-energy protons or gamma quanta, which is similar to visible light, but with a much shorter wave length. The confirmation or disproval of this hypothesis is possible for the first time because of the use of satellites. In any case our representations of the Sun and its activity will be more complete. If it is discovered that the Sun emits high-energy photons, then it is possible for a very marked perspective to be opened to astronomers in the study of celestial bodies. This can be done not only by means of the rays of visible light and with the aid of radio waves recently discovered by astronomers, but also through the use of high-energy photons.

Sputnik III will investigate still another problem related to the physics of cosmic rays, namely, to register the presence in these rays of heavy atomic nuclei. Whether these nuclei enter into the composition of primary cosmic rays and a knowledge of the "assortment" of the nuclei in them, is very important for science and, in particular, for astrophysics. Investigations by Sputnik III will make it possible to throw some light on this important problem.

Prof A. Yakovkin, Corresponding Member of the Academy of Sciences Ukranian SSR, explained that the study of the Sun is of great interest in two respects. In the first, the state of the Earth's atmosphere depends on the Sun's radiation, and in the second, the Sun is the typical representation of billions of stars which are in the same stage of development. Studying this star, which is nearest to us, it will be possible to obtain information concerning the physical nature of stars in general. These and other important problems can be successfully investigated with the aid of the artificial earth satellites.

In regard to the observation of this new cosmic body, Sputnik III, Prof B. V. Kukarkin, chairman of the Astronomical Society of the Academy of Sciences USSR, had this to say:

Observations of the motion of Sputnik III are of great value to astronomical science. It has a greater altitude range and greater average height than the two preceeding Soviet sputniks, and its orbit presents a still more elongated ellipse. All of this will make it possible more precisely to determine orbital changes. Sputnik III will have a longer life than Sputniks I and II, and meteorological conditions during the spring and summer will be more favorable for observations.

The Astronomical Society of the Academy of Sciences USSR, to whom was entrusted the organization of the optical observations, generalized the experience of the work of Soviet stations during the period of observations of Sputniks I and II. As a result, a number of new proposals were introduced which considerably improved and widened the program of the work. Now, for optical observations, 70 stations have been equipped. Twenty-five of the stations have been equipped with special cameras. The trail of the sputnik will be recorded on film and precise time notations will be made. Thus, unequalled accuracy is achieved in determining the location of the sputnik.

In the Main Astronomical Observatory of the Academy of Science USSR at Pulkovo, in the Astronomical Institute imeni P. K. Shternberg in Moscow, and at other astronomical institutes of the USSR, new experimental devices will use electronic-opitcal converters, photoelements, and other apparatus which will make precise observations possible. Some of these devices will operate automatically.

This accumulated experience also aids in quickly calculating the orbit and changes in its elements. At present, electronic computers will be more widely used. All of the incoming data on the sputnik's coordinates will be used at once for the calculation of its orbit.

Soviet astronomers supplied with the latest methods of observation have at their disposal great possibilities for establishing rules for the movements of artificial earth satellites. This is important for the solution of many general theoretical problems of physics, astronomy, and geophysics. Such observations on orbital changes, in the final analysis, will give a better knowledge of the Earth's field of gravity, and will allow a more accurate determination of the shape of our planet.

First reports of sightings of the Sputnik III and its rocket carrier were received at the Astronomical Society from Tashkent, Abastuman, Ashkhabad, and other southern points of the USSR. These reports disclosed that the rocket carrier was seen with the naked eye as a star of the third magnitude, and the sputnik itself could be observed only with the aid of binoculars or telescopes.

Observations for the sputnik will be conducted not only be Soviet scientists but also by astronomers in Poland, Czechoslovakia, Bulgaria, Hungary, Rumania, and the German Democratic Republic, where, for this purpose especially equipped stations were built. Prof Chang Yu-che, director of the Purple Mountain astronomical observatory near Nanking, who recently arrived in Moscow, spoke of the great interest of Chinese astronomers in Sputnik III. Chinese scientists have equipped several stations for observing the sputnik.

During the life of Sputnik I and II, much observational data was received by the USSR from the US, France, England, Scotland, Ireland, and other countries. Kukakrin expressed the hope that the amount of information received from these sources would be even greater during the life of Sputnik III. The first telegram from the US reporting successful sightings of Sputnik III has already been received.

As of 0600 Moscow time on 25 May, the third artificial earth satellite, which was launched at 1341 Moscow time on 15 May 1958, completed 131 revolutions of the Earth. All of the scientific apparatus and the radio transmitters carried by Sputnik III continue to function normally. (Moscow, Pravda, 16-25 May 58; Izvestiya, 16-18 and 20-25 May 58)

Artist's Concept of a Man-Carrying Satellite

Under the headline, "A Man Could Be Carried With Ease in the new Satellite," the Bucharest daily Rominia Libera reprinted a Tass dispatch, datelined Moscow, 16 May 1958, which quotes Soviet Academician Sedov as saying that it would be possible for a rocket to be sent to the planet Mars within 20 years; asking foreign, as well as Soviet, scientists to collaborate in observing the present satellites; and stressing the suitability of the third Soviet satellite for such international observation.

An artist's sketch accompanies the article, but the caption, which says that the sketch is based on the dimensions of the third Soviet satellite, does not make clear if the artist is a Tass staff member or a member of the staff of Rominia Libera. The sketch shows a conical rocket nose cone 1.73 meters in diameter at the base and 3.57 meters from base to tip enclosing various scientific instruments and equipment. A man, encased in what appears to be a pressure suit with a bubble helmet, is seated in a semireclining position on an acceleration couch, facing the viewer. (Bucharest, Rominia Libera, 17 May 58, p 4)

Soviets Continue to Popularize IGY With Satellite Literature

Stuchni suputniki Zemli (Artificial Earth Satellites), by A. A. Yakovkin, is a 48-page pamphlet published by the Publishing House of the Academy of Sciences Ukrainian SSR which discusses the problems involved in investigations of the upper atmosphere, tells about rockets and the launching of artificial satellites and their movement around the Earth, and the conquest of cosmic space -- providing conditions for man's passage beyond the limits of planet Earth, i. e., flight to the Moon and Mars. The end of the brochure gives information on artificial Earth satellites, the Sun, Earth, Moon, Mars, and Venus. (Visnyk Akademii Nauk Ukrains'koi RSR, No 3, Mar 58, p 77)

Sputnik Observation Posts in China

The Academia Sinica has made arrangements to set up observation posts for detecting USSR artificial Earth satellites at 12 points in China. These will be in Peiping, Nanking, Lan-chou, K'un-ming, Lhasa, Wuhan, Ch'ang-ch'un, Canton, Sian, Urumchi, Tientsin, and Shanghai. (Peiping, Hsin-hua Jih-pao, 4 Nov 57)

The "Lunar" Interferometer

The use of the Moon's atmosphere and ionosphere as an interferometer is presented in an article entitled, "The Lunar Interferometer," by G. A. Gurzadyan of the Byurakan Astrophysical Observatory, Academy of Sciences Armenian SSR.

In radio astronomy two types of radiointerferometers are used -- double antenna or multiantenna interferometers are used when the interference of radio waves from cosmic discrete sources are realized with the aid of two or many antennae, and the marine interferometer is used when interference is accomplished with the aid of only one antenna located high near the sea shore. The role of the second antenna in the latter case is assumed by the surface of the ocean.

Along with these, it is possible to present still another type of interferometer, one using condition brought about by the fact that on the Moon, there is an extremely rarified atmosphere and, consequently, also an ionosphere. Radio waves from a discrete source which occur in the celestial sphere near the lunar disk can reach observers on the Earth both directly, as well as through the lunar ionosphere, and are distorted because of this in certain values. As a result, they can interfere at the point of reception. Thus, the Moon's ionosphere, or merely the Moon, in this way fulfills the role of the second antenna or the surface of the sea. Such an interferometer can be called, "lunar." The lunar interferometer possesses a high resolving power and because of this, it appears to be a very valuable means for determining the angular measurements of very small discrete sources of cosmic radio emanations. The basic principles of the operation of the lunar interferometer and the method of determining the angular measurements of discrete sources are as follows.

The ability of the lunar ionosphere to refract radio waves is characterized by the parameter φ_0 and is called the "full lunar refraction." Radio waves from a cosmic source which occur in the limits of this angle about the lunar disk will be propagated to Earth both directly, as well as through the Moon's ionosphere. The value of φ_0 depends on the electronic concentration of the ionosphere (and consequently on the Sun's activity) and the wave lengths. For meter waves φ_0 is measured in minutes and even in tenths of minutes of an arc. For simplicity, it is assumed that cosmic sources have a rectangular form, with a width (in the direction relative to the observable motion of the Moon and of the discrete source) equal to β_0. The total intensity of radiation of the source in wave lengths is indicated as I_0, and the intensity of a single width of the source as I_0/β_0, and $\frac{I_0}{\beta_0}d\beta$ is the intensity of the element of the width $d\beta$. At a certain distance $\varphi - \beta$ of this element from the edge of the Moon's disk, a difference Δs is formed between the direct and bent rays, the value of which is equal to

$$\Delta_S = \frac{D}{2}(\varphi - \beta)^2$$

where D is the distance from the Moon to the Earth. According to this difference, the receiver on Earth will take in a certain intensity.

A formula is derived which is correct up to the partial eclipse of the source by the Moon. In the latter case, another formula is used. Using these two formulas, it is possible to construct a curve describing the change in intensity from the moment of the appearance of the interference pattern up to the time of its complete disappearance. These two formulas can be integrated either numerically or graphically. This is a harmonic oscillation with a variable amplitude -- a beat.

The interference pattern in the case of a lunar interferometer must represent its own curve of the dampening beat.

A simple formula is derived which represents the visible size of the cosmic radio sources. The continuation of a single beat in a scale of time is somewhat more than one minute. It is noted that in work using the lunar interferometer, measuring apparatus with a constant time order of a second or several seconds are necessary. The constant time is decreased during the transition from long to short waves. In the case of the lunar interferometer, it is expeditious to operate in a meter range of long waves.

The value of the period of oscillations obtained determines the limitation in relation to the width of the band pass of the receiver by $2\Delta f$, and in the opposite case, the interference pattern does not develop. Therefore, the evaluation of the maximum value of (Δf) maximum should be given.

II. UPPER ATMOSPHERE

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A simple formula is derived which represents the visible size of the cosmic radio sources. The continuation of a single beat in a scale of time is somewhat more than one minute. It is noted that in work using the lunar interferometer, measuring apparatus with a constant time order of a second or several seconds are necessary. The constant time is decreased during the transition from long to short waves. In the case of the lunar interferometer, it is expeditious to operate in a meter range of long waves.

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In conclusion it is noted that the moment of the appearance of the interference pattern (decaying beat) gives a lower value of the magnitude of the full angle of refraction φ_0 in a given wave length and with a given state of the lunar ionosphere. The indirect possibility of conducting this type of daily service on the state of the lunar ionosphere is obtained. (Doklady Akademii Nauk SSSR, Vol 118, No 6, 1958, pp 1,094-1,097)

Recommendations for Telescope Tube Design

The quality of star images in telescopes is affected not only by the optical precision of the instrument, but also by the heterogeneities of the air and convection currents present in the tube. In telescopes of large diameter, the latter is one of the most predominant factors in tube design. However, a comparison of open (lattice) and closed telescope tubes from this viewpoint shows an advantage peculiar to each design. In the open tube, temperature stabilization along the length of the tube and of the mirror itself occurs more quickly than in a closed tube, whereas the possibility of heterogeneous air entering a closed tube and causing image distortion is slight.

The task of deciding which of these factors has the more predominant effect on image quality, or, in other words, which design should be adopted for telescope construction, was assigned to the Main Astronomical Observatory of the Academy of Sciences USSR at Pulkovo. The project was conducted under the supervision of Maksutov and included the specific job of designing a telescope for the 2.6-meter Crimean reflector.

A double telescope, designated DT-200, was constructed by specialists at this observatory for performing the assignment. It consisted of two rigidly attached tubes, one of which was lined with metal foil backed up by cardboard and the other latticed. The diameter of the main mirror was 200 millimeters; the magnification, 470 times the equivalent focal length, 8,040 millimeters; and the diameter of the exit aperature, 0.43 millimeters. Both mirrors were spherical and designed so that together they distorted the wave front by less than one fourth of the wave length. Checks of the mirrors showed that the optics of both tubes were perfectly prepared and that the telescopes produced images of precisely equal quality.

Observations with this instrument were conducted in the dome of the former 40-inch reflector of the Simeiz Observatory from 24 August to 7 September 1955 by the authors of this article, T. N. Golovanova and K. L. Mench, and associates of the Crimean Astrophysical Observatory, Monazhenko and Tsenter. Polaris was used as the object. Observations were made at different hours of the night, and by no less than three members, to insure an objective evaluation of the quality of the diffraction picture. The results were formulated as follows:

1. The quality of the image in the closed tube at different instrument positions (within the dome and protruding from the dome window) was always better than that in the open tube.

2. The mobility of the image in the closed tube was considerably less than in the open tube under all conditions. Frequently, image instability in the open tube precluded satisfactory evaluation of the diffraction image.

3. Introduction of an aluminum shield to isolate thermal radiation and convection currents of air from the observer considerably improves the diffraction picture in the open tube but has practically no effect for the closed tube. However, even with the shield, the open tube gives a poorer image than the closed one. Without the shield, temperature difference at the ends of the tubes was 0.7 to 0.8 degrees centigrade. Introduction of the shield lowered the difference to 0.1 to 0.2 degrees centigrade.

As a result of the project, builders of astronomical instruments were given the following recommendations:

1. In all cases where possible, incorporate a closed tube.

2. If the telescope is constructed with an open tube, correct the effect of thermal radiation and convection currents from the observer by some means of insulation. (Pribory i Tekhnika Eksperimenta, No 1, Jul - Aug 56, pp 81-82)

Meteorological Station Network in Anhwei Established

A complete meteorological observatory and station network has been established in Anhwei Province. At present, there are 3 meteorological observatories (including a civil aviation meteorological observatory), 13 meteorological stations, and 45 weather stations. In addition to these, there is one station conducting radiosonde measurements of the atmosphere, and three which conduct wind studies with pilot balloons. (Ho-fei, Anhwei Jih-pao, 25 Dec 57)

New Kirgiz Wind Station

Observations of temperature, humidity, pressure, and wind at various altitudes are being conducted at the new wind station in Kirgiz, which was completed at the end of 1957. The station has a white main building with a 7-meter tower supporting directional antennas. Hydrogen-filled balloons about 3 meters diameter, with radio and instrument equipment, are released near the main building. One of these radiosondes is reported to have reached an altitude of 36 kilometers. Fixes on the radiosondes and reception of their ultrashort-wave signals are accomplished with a high-precision radio theodolite nicknamed "Malakhit."

According to the author of this news article, Engineer-Aerologist Yu. Leonov of the Frunze Hydrometeorological Observatory, "several tens" of such Soviet designed radio theodolites are already in operation in similar installations in Kirgiz and are providing valuable information for weather forecasting and high-altitude flying.

Operations at the station are performed principally by such young members as Aerologist Inna Bitkina, graduate of the Tashkent Hydrometeorological Technicum; Aerologist El'vira Bormat, graduate of the Khar'kov Hydrometeorological Technicum; Radio Technician Aleksandr Gorlanov, graduate of the Tashkent Technicum of Communications; Al'bert Morkovkin, graduate of the Ivanovo Industrial Technicum; and others.

Telegrams with results of radio soundings are sent twice daily to Frunze and from there to Tashkent and Moscow. (Frunze, Sovetskaya Kirgiziya, 21 Mar 58)

Expeditions of the Mikhail Lomonosov

The following is a complete translation of an article entitled "Expeditionary Investigations by the Ship Mikhail Lomonosov," by Prof V. I. Grabovskiy, Prof A. G. Kolesnikov, and A. A. Ivanov, Doctor of Physicomathematical Sciences.

In the program of the work of the IGY, the expeditionary investigations of hydrophysical processes in the Atlantic Ocean occupy an important place.

Contemporary investigations of the oceans and seas show that all the most essential processes in them develop as a result of the thermal and dynamic interaction of the ocean and the atmosphere. Therefore, most attention must be directed toward the study of the processes of the heat exchange between the atmosphere and the ocean, the convection of heat in the deepwater of the ocean, the transmission of the wind's energy to the surface of the ocean, wind energy propagation in deep water, and the development of waves and currents.

The most complete and detailed investigation will be conducted in the North Atlantic, in particular in the polar front region, that is, in the zone of mutual interaction of the warm and cold water masses. The concentration of work in the North Atlantic is explained primarily by the important effect which this region exerts on the heat regime of the northern seas and the polar basin and also on the climate and the weather not only of adjoining but also of distant regions, in particular on the climate and weather of the greater part of our country. In addition to this, one of the most important routes of international communication lies in the North Atlantic, and there are found regions rich in fish for commercial purposes.

A distinct feature of the projected investigations is that they will be conducted, not by means of indirect methods, as has been the case up to now, but by direct instrument measurements.

Besides the standard oceanographic observations (actinometric, meteorological, hydrological, and hydrochemical) a number of special measurements will be made, which, up to now, had not been conducted by expeditions. For example, the continuous and simultaneous registration of turbulent micropulsations of temperature, the horizontal and vertical components of the velocity of the wind at different levels and in the atmospheric layer near the water, and currents at different depths in the ocean; the continuous registration of all the components of the heat balance; the registration of all the elements of wind waves, including also the time when the ship is under way; the density of currents of telluric origin; and so forth.

In accordance with the decision of the Interdepartmental Committee for the Conduction of the IGY [USSR], investigations in the North Atlantic must be made by the scientific research ships Mikhail Lomonosov, the Ekvator, and the Sevastopol'. The Mikhail Lomonosov, as the largest of the ships and having the greatest autonomy of voyaging, must work in the five southern standard hydrological profiles located in the widest part of the Atlantic Ocean.

The expeditionary ship Mikhail Lomonosov, constructed in the German Democratic Republic Neptun shipyard in Rostok, is a comparatively large (6,000-ton displacement), fully equipped expeditionary ship with a short forecastle tank. The reinforced hull makes it possible to conduct work in ice-filled waters. A piston with a turbine working off the exhaust steam is located in the central part of the ship. The boilers are oil-fired.

The boat deck is extended as far as the stern, with the aim of the adaptation of part of it as a landing area for a helicopter, which it is intended to be used on the expedition for raising meteorological instruments and conducting special physical investigations of the air masses. The helicopter landing area is designed for loads up to 20 tons and is used for the launching of radiosondes, pilot balloons, and the placing of the heavy measuring devices -- recording devices. In addition to this, a radio theodolite will also be located here.

On board the ship are special apparatus and equipment. A deepwater winch with a cable 15,000 meters long ensures anchoring the ship in depths of down to 10,000 meters. Eight hydrological winches of the "Okean" type make it possible to lower instruments to this same depth. A deepwater trawling apparatus, to trawl and to lower trawling devices down as far as 4,000 meters; three self-recording fathometers for registering depth on tape: one in the range from 0 down to 5,000 meters, another down to 12,000 meters, and the fathometer "Lodar" for vertical and horizontal sounding (it can be used for detecting shoals of fish); and other instruments are also on board. Experimental workshops and 16 laboratory installations occupying a total area of 300 square meters are provided with modern equipment. The ship's range is about 11,000 nautical miles at an average speed of 13 knots, which corresponds to voyaging continuously for 30 days. In addition to this, the ship can drift for 20 days with normal operation of all its mechanisms.

The selection of the route for the ship's first voyage, undertaken with the aim of testing the scientific and special ship's equipment, was determined by certain specific conditions.

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First of all, the selected region possesses good conditions for anchoring the ship, and it is at a short distance from the standard hydrological profiles of the IGY plan. Thus, with the successful conclusion of the test work, the expedition could, in the shortest time, fulfill the scientific investigations according to the problems of the IGY. Then the distance up to the port of registration (Riga) had great value. It must be the shortest to spend the least time in returning to port for the correction of discovered faults in the equipment.

Finally, of no small importance is the making of oceanographic surveys in the northeast region of the North Atlantic. Thus, the oceanographic survey was spread also in Atlantic waters, which, in a considerable degree, cause the regime of the waters of the northern seas, where in July and August of 1958, an oceanographic survey by ships of other organizations will be conducted.

After a month of sailing, the Mikhail Lomonosov returned to Riga on 23 December 1957.

A number of tasks were fulfilled on the first voyage. By means of observations conducted at sea, it was established that in November and December, the upper depths of the water, in the region which was studied down to depths of 600-800 meters, shifted and had no temperature stratification. In the levels near the bottom of the northern profile, layers of water with negative temperatures, indicating the inflow of deep Arctic waters from the Norwegian and Greenland seas, were discovered in the depressions. In the underwater slope near the shores of Iceland, the waters of the upper levels sink into the depths. Return stations in the first profile conducted within 10 days did not show any substantial change in the heat content and temperature stratification of the waters of this profile. The character of the distribution of temperatures remained the same. Hydrochemical analyses confirmed the existence in the middle levels of a wide layer of water with a minimum oxygen content. The surface water masses of the Atlantic in the southern profiles lie over deep Atlantic water masses, while in the northern stations (No 47-50), they lie over the deep water masses of the Norwegian and Greenland Seas. In the region near Iceland, the existence of polar East-Icelandic water masses was confirmed. The sliding of these water masses from the Iceland shelf according to the continental slope and their further spread in the intermediate layer between the surface and deep waters of the Atlantic was discovered. Last, the settling of surface plankton to deeper levels, and also the distribution of dissolved oxygen, nitrates, and phosphates, were confirmed.

More than 5,000 chemical determinations of extracted samples of ocean water were made, and as a result, interesting material according to the distribution of chemical elements in the region studied were obtained, making it possible to learn of additional characteristics of the water masses. The coefficient of reduction of light in extracted sea water samples in different parts of the spectrum showed that the content of suspended matter and colored organic compounds was extremely small, especially in comparison with the waters of the Baltic and the eastern part of the North Sea.

Samples of ocean water are collected and preliminarily processed for their content of organic matter according to organic carbon and nitrogen. These determinations, together with set experiments for the determination of the diminution of oxygen (biochemical consumption of oxygen) for long periods, provide new material for the evaluation of biochemical processes taking place in the ocean and the age of water masses.

Soil samples were collected in 30 stations and investigations of suspended materials were conducted in 43 stations. The maximum length of a soil core taken with a 7-meter corer was 382 centimeters. Suspended matter was collected on 101 suspension filters and 40 analyses of its qualitative and quantitative properties were conducted.

Running measurements of the depths along the whole route were taken. At the point with the coordinates 59°02' N and 15°37' W, a sharp rise of the bottom up to a height of 560 meters, not indicated on the map, was discovered. According to the data of the fathometer measurements, a profile of the bottom was compiled and a geomorphological interpretation of the data according to the relief was conducted.

Separate measurements of the largest storm waves showed that their heights could attain 8-9 meters and periods of 10-12 seconds. Wave disturbance was recorded from the ship with the slotted photowavegraph system of A. A. Ivanov. About 10,000 waves were registered.

For the first time, observations were conducted at sea with radiosondes not only of the pressure, temperature, and the moisture content of the air, but also of the direction and velocity of the wind at altitudes of up to 25,000 meters.

Many new instruments were tested; among them, a turbulence meter under sailing conditions, a density meter, a transparency meter, wave graphs of different systems, etc. The methods of using these instruments and of processing results obtained were developed. Recording of the temperature and current pulsations of water at depths down to 150 meters were obtained.

A group of German scientists under the leadership of Dr E. Bruns, was on board. The group conducted gradient observations of the temperature and moisture content of the air and the velocity of the wind, made measurements of the elements of the radiation balance, of the heat balance of the ocean, and of sea waves and tested new instruments. Cooperative investigations and acquaintance with the works of the Institute of Marine Hydrology in Warnemunde and Rostok made it possible for the Soviet specialists in the different fields of geophysics and oceanography to establish fruitful, business-like contacts with the scientists of the German Democratic Republic.

Expeditionary work on the first voyage according to the plan of the IGY was fulfilled in accordance with the schedules of the following crews: temperature measuring, sea turbulence, marine hydrology, marine meteorology and aerology, ship meteorological stations, shipbuilding, navigation instruments, marine hydrochemistry, plankton, marine geology, terrestrial magnetism, and electrical currents. The scientific and technical staffs of the crews were manned by scientific research institutes whose expeditionary investigations were included in the plan of the work.

The program of the expeditionary work of the second voyage was composed with the idea of conducting joint investigations according to a coordinated plan with the expeditionary ships Ekvator and Sevastopol.

The principal oceanographic work of this voyage will be fulfilled according to the plan of the IGY in five hydrological profiles. The scheme of hydrological profiles of the second voyage was compiled with the aim of obtaining the greatest number of observations in the northeast part of the North Atlantic for characteristics of the seasonal variations of the structure of the waters of North Atlantic currents down to the penetration of these waters in the northern seas. During the compilation of these profile schemes, conditions were imposed so that part of the southern standard hydrological profiles intersected the main waters of the North Atlantic Current.

In addition to this, the Mikhail Lomonosov will conduct hydrophysical and oceanographic work on profiles from the latitude of the Cape of Gibraltar south along the 30th meridian to about 5 degrees south of the Equator and will also make six latitudinal profiles near the west coast of Africa. Work on these profiles is included in the plan, not only with the aim of studying the latitudinal variations of the temperature regime of the waters, of oceanographic circulation, and of the magnetic and electrical fields of the Earth in the central part of the Atlantic Ocean, but also to conduct observations in the region of the investigations with the diesel-electric ship Ob during its 1958 voyage. This will make it possible to obtain differences in measurements and with these to characterize the seasonal variability of the elements of the hydrological regime in this part of the Atlantic Ocean.

Work of a general nature also will be conducted on the second voyage, namely, fathometer measurements in the open sea along the route, standard meteorological work according to the program of the ship's stations with the launching of radiosondes and pilot balloons, gradient measurements of the temperature of the air and the velocity of the wind on the route and more widely, according to drifting and 24-hour stations.

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Standard oceanographic observations will be conducted in drifting and 24-hour ship anchor stations, on Rosemary Bank, on the 30th Meridian, in the waters of the North Equatorial Current, in the waters of the South Equatorial Current, and on profiles near the west coast of Africa.

The taking of soil samples with bottom scoops and geological corers, deep-water trawling (two in the central part of the Atlantic Ocean and one south of the Equator), and also two industrial trawlings and the collecting of plankton in drifting and anchor stations with the aim of calculating the effect of organisms on the diffusion of light and sound in the water of the ocean have been provided in the program.

The Mikhail Lomonosov departed on 23 February 1958 on its second voyage, which is to last for 4 months. (Vestnik Akademii Nauk SSSR, No 4, Apr 58, pp 86-90)

Zarya on Fifth Atlantic Crossing

The schooner Zarya was reported in mid-March to have taken on fuel and water at St. Helena Island and to be progressing toward the shores of South America on its fifth Atlantic crossing.

According to the ship's special correspondent, severe operating conditions were being encountered in the tropic zones and certain equipment had to be repaired. Despite the strain and difficulties involved in such a hot climate, observations were being conducted successfully.

While in the central portion of the Atlantic, the expedition visited a number of ports, receiving a particularly warm welcome in Ghana. IGY scientists in Ghana and students inspected the Zarya. In turn, members of the expedition visited the laboratories of the University of Accra and met with students.

Valuable material giving information on the character of the magnetic field in this portion of the Earth's sphere was obtained during the 7 months the Zarya plied the Atlantic. Results of observations have confirmed the deduction of the presence of magnetic anomalies tied in with underwater mountain ranges in the Atlantic. (Moscow, Pravda, 12 Mar 58)

IV. SEISMOLOGY

Chinese Seismic Stations Record Mongolian Earthquake

A violent earthquake was recorded on 4 December 1957 by 23 seismic stations in China. According to seismological experts of the Geophysical Research Institute of the Academia Simica, the focus of the earthquake was located in the western part of Mongolia. The time at the focus was 1137.5 hours. (Peiping, Jen-min Jih-pao, 6 Dec 57)

V. ARCTIC AND ANTARCTIC

Oceanographic Research in Arctic

In addition to research conducted by the expedition on the Lena in the Greenland Sea, oceanographic research under the IGY program will also be conducted in the Bering and Chukchee seas on the expedition ship Lomonosov. These investigations will help obtain a clearer picture of the water exchange between the Pacific Ocean and the Central Polar Basin through the Bering Strait.

No new drift stations will be organized in the Arctic in 1958. The existing stations Severnyy Polyus-6 and Severnyy Polyus-7 will continue their drift with a new staff of scientists.

A hydrographic expedition of the Main Administration of the Northern Sea Route, headed by P. Ya. Mikhalenko, is working on Franz Josef Land. This expedition will explore the northern, least known part of the archipelago by plane, truck tractor, cutter, and other means of transportation. Hydrographers, hydrologists, topographers, and geodesists will work in the coastal and insular regions to prepare navigational aids to meet current requirements. This will safeguard navigation in the remote polar regions. (Moscow, Trud, 20 Mar 58)

New Island Discovered in Antarctic

As a result of a study of recent aerial photographs made by Engineers Malyutin, Lavrenov, and Burlachenko, a new island was discovered which had not been shown previously on the map of the Antarctic. To explore the newly discovered island, an AN-2 airplane piloted by Perov took off from Mirnyy during the last few days. A group of scientists headed by Ye. I. Tolstikov, chief of the expedition, were aboard the plane. The plane circled the area of the island for 2 1/2 hours and finally landed on it, after having found a suitable landing strip. The scientists made some surface soil tests and took samples of sedimentary rock. Some of the rocks on the island were covered with a thin layer of dark moss. The existence of moss and lichens on the open island proves that it has been free of ice for a relatively long period. Bones and feathers of Adelie penguins were found at the foot of the island; these birds had apparently come to the island at some time in the past for molting.

The members of the aerial expedition erected a cairn on the island, with a note describing the first visit to the open island. The Soviet Antarctic Expedition has entered another previously unknown island on the map of the Southern Hemisphere.

According to a radiogram from the Antarctic, the island is about 60 kilometers northwest of Oazis and 330 kilometers east of Mirnyy. It is oval in shape. (Moscow, Vechernyaya Moskva, 15 Apr 58)

Meteorological Research in Antarctic

"Until recently, many scientists were of the opinion that the antarctic atmosphere is more or less separated from the rest of the atmosphere by an intense 'wind barrier,' i.e., a narrow zone of strong west winds, which encircle the globe between the 40th and 60th parallels south latitude and form an insurmountable barrier for the air flowing in a meridional direction. It was believed that the antarctic atmosphere had little effect on the rest of the atmosphere. It was assumed until now that, analogous to the Northern Hemisphere, the high-pressure area (anticyclone) over the southern polar regions recedes rapidly before the high-altitude polar cyclone (area of relatively low pressure). These conclusions were based on fragmentary data and no one was entirely convinced of their correctness.

"There are many other problems requiring attention. If the access of air from warmer latitudes to Antarctica should actually be prevented by a 'wind barrier,' then what is the origin of the moisture nourishing the ice sheet, which continuously breaks up in the form of icebergs, and yet never seems to diminish? All these questions may be answered by the joint research operations of many countries in Antarctica during the IGY.

"The meteorologists of all Soviet antarctic stations have conducted their regular observations despite hurricane winds in Mirnyy and Oazis; severe frosts at Vostok-I, Komsomol'skaya, and Vostok; and a combination of heavy winds and low temperatures at Pionerskaya.

"The difficulties connected with the launching of radiosondes at Mirnyy under adverse weather conditions were somewhat reduced after the construction of a specially designed 11-meter tower, but even then repeated launching attempts had to be made frequently in the case of winds of 30 meters per second or more. It is usually considered that with winds of 20 meters per second the launching of a radiosonde is impossible. At the Mirnyy observatory the radiosonde launching was interrupted only once, when a hurricane wind of over 50 meters per second destroyed the covering (obshivka) of the tower.

"At the station Oazis, situated east of the Pravda Coast in an area known for its hurricanes, radiosonde launching was interrupted briefly when strong winds destroyed the aerological pavilion and carried off the pieces of the building over a distance of over one kilometer. At the station Vostok-I, and later at Vostok, the scientists had a hard time, because of the severe frost, assembling the duralumin frame of the aerological pavilion for the radiotheodolite. However, the job was well done and made it possible to carry on an uninterrupted study of the upper atmosphere.

"Actinometric observations of elements of solar radiation were carefully organized and systematically conducted at the Soviet antarctic stations. It may be noted that by far not all the foreign antarctic stations conducted this type of research. The scientists made more than 30 flights on planes equipped with special instruments, to make horizontal and vertical, actinometric soundings, and to determine the elevations of the antarctic ice sheet in the area of operations of the Soviet stations. The flights were made over the interior regions and over the coast of the Indian Ocean.

"Even now, after preliminary processing of the material obtained from observations of Soviet and foreign antarctic stations, it may be said that a considerable amount of information has been obtained. For example, it was determined that the anticyclone in Antarctica, observed on the surface, is preserved up to a high altitude, frequently up to 8 or 10 kilometers; on the other hand, in the Arctic the anticyclone usually changes over into a high-altitude cyclone at a height of 3-4 kilometers. This is understandable, since Antarctica in itself represents a cold underlying surface, elevated to a height of 4 or more kilometers.

"The data of radiosonde observations and airplane flights indicate that the cooling of the atmosphere by the ice continent is considerable. In the winter, the air in the lower layers over the central regions of Antarctica is 30-35 degrees centigrade colder than in the upper layers. However, this cold layer is not very deep, being only about 300-600 meters. Nevertheless, this relatively thin cold layer over the high ice sheet has the same effect as cold air of great vertical expansion.

"Above the parts of the continent protruding to the north, steady ridges (otrogi) of relatively high atmospheric pressure are formed. They create a type of air circulation, according to which the air flows from the continent to the sea on one side of the ridge and from the sea to the continent on the other side of the ridge. These meridional movements of air prevent a free circulation of cyclones around Antarctica.

"The material collected during 2 years of observations made it possible to determine the existence of six climatic, cyclonic zones and, accordingly, six intermediate areas of relatively high pressure around Antarctica. In the high-pressure areas, the meridional movement of air predominates, and, depending on which of these areas are more developed at certain times, an intensive exchange takes place in one region or another between cold antarctic air, sometimes reaching as far as subtropical latitudes, and the warm air of temperate zones and even the subtropics. This warming-up process in Central Antarctica brings with it clouds and precipitation. It should be noted that in the interior regions precipitation sometimes occurs without clouds. This is something like rime, which forms directly on the snow surface, or ice needles formed in the lower layer of the air at a very low temperature. It becomes evident that the ice balance of Antarctica is maintained in many cases by the intrusions of warm air. There is no insurmountable 'wind barrier' around the continent, and the antarctic atmosphere participates actively in the atmospheric circulation of the Southern Hemisphere.

"It is difficult to describe in one article all the new information which has been obtained during the period of operation of the Antarctic Expedition and as a result of the joint international efforts under the IGY program. Soviet scientists are happy to contribute their share to this great and useful undertaking." -- O. Krichak, chief of aerometeorological detachment (Moscow, Vodnyy Transport, 26 Apr 58)

Antarctic Ice Cover

"The work of the glaciologists of the Soviet Antarctic Expedition consisted in extensive research on the ice sheet of Antarctica and in a comprehensive study of the problem of glaciation of that continent with the use of modern complex methods. In addition to stationary observations, conducted in the region of the Mirnyy observatory, and at the stations Oazis, Pionerskaya, and Vostok-I, during the period of one year, a large amount of field work was done. With the help of sled-tractor trains, short field trips with caterpillar-track, over-snow vehicles, and plane flights with landings in remote places, the glaciologists investigated a large area of East Antarctica. About 2,500 test holes were drilled for the study of the internal layers of ice sheet, including one hole with a depth of 371 meters.

"This field work was supplemented by laboratory research on samples of snow, firn, ice, and frozen rock.

"As a result, a large amount of material was collected. After it has been processed, it will be possible to explain the form, thickness, heat regime, internal processes, structure, physico-mechanical properties, and the mass budget of the ice sheet; the interrelation between the ice cover and the relief of the continent buried underneath; and the climate and regime of the surrounding ocean.

"Naturally, many of these problems could not be solved completely during a one-year period. This is especially true for the interior regions of the continent. Glaciologists will have to work a great deal on the most important problem of determining the thickness of the ice sheet and the depth of occurrence of the bedrock foundation in regions removed from the coast. However, even at this time some of the problems have been definitely solved. As an example, two of these may be mentioned.

"Until recently, the theory existed that a strong, high-altitude cyclone prevailed in the Antarctic at an altitude of over 2,000 meters above sea level, which fed snow to the central part of the glacier. The aerological and meteorological observations of the past year have definitely disproved the existence of such a cyclone. It was proved that a very steady, high anticyclone has developed above the ice sheet. The study of the snow cover made by Soviet glaciologists showed that the nourishing of the ice sheet takes place mainly in the peripheral zone, which is 500-600 kilometers wide, with the snow of periodical cyclones penetrating into this region. Further in the anticyclonic area, the amount of precipitation is about one tenth of that in the coastal region. Even this slight quantity of snow is sufficient to nourish the central part of the glacier.

"The glacial cover reacts to the irregular distribution of the amount of snow received by a change in its form, i.e., its central part becomes very flat. As a result, the movement of ice in this part takes place very slowly. Almost all the ice flowing to the coast of the ocean and breaking up in the form of icebergs is formed on the periphery of the glacial cover, which is characterized by a relatively steep incline of the surface and a considerable speed of movement. Thus, the existence of the entire antarctic ice sheet is maintained by peripheral cyclonic precipitation. The central anticyclonic area merely plays the part of a powerful source of cold, which transforms the atmospheric moisture moving in from the ocean into a solid form.

"A second important problem is: does the ice sheet of Antarctica grow simultaneously with other glaciers of the earth, or, on the contrary, is it decreasing?

"Glaciologists of the Soviet Antarctic Expedition repeated the topographic survey and the measurements of the peripheral glacier movement on Gaussberg of Wilhelm II Coast. This work was done from the same base used 55 years ago by the German polar explorer, Erich Drygalski. It appeared that since 1902 the surface of the glacier was lowered on an average of 8 meters, and the speed of its movement has not changed. Thus, together with the greater part of other glaciers of the Earth, the antarctic glacial cover has undoubtedly receded in the 20th Century, although very slowly, at about one twentieth to one twenty-fifth the rate of the glaciers of the Eastern Alps. It will be possible to explain this reaction of the ice sheet to the change in climate only after the mass budget has been calculated and its connection with meteorological conditions has been analyzed. The problem concerning the tendency of the development of glaciation in Antarctica and other parts of the Earth has been solved by Soviet scientists with the help of direct observations." -- P. Shumskiy, chief of glaciological detachment (Moscow, Vodnyy Transport, 26 Apr 58)

Soviets Accelerate Spring Thaw

Shipping can begin 20-30 days earlier at the North Pole if dark-colored sand is scattered on ice floes from a plane. In the spring, when the ice has broken up, these ice floes along the coast often impede the progress even of icebreakers. When a mixture of coal dust and dark sand is scattered evenly on the ice floes, their ability to reflect sunlight is reduced and they thaw more rapidly.

According to Dr Ivan S. Peschanskiy, director of the All-Union Arctic Scientific Research Institute, this procedure has been successfully used to promote thawing at various regions of the North Pole. It is used also to break up ice jams on the northern sections of the Dvina River as well as on the waters of the Caucasus and the Pamir. (Budapest, Technika, No 4, Apr 58, p 7)

VI. CONFERENCES

Soviets Prepare for Tenth International Astronomical Conference

On 23 May 1958, the program for preparations for the Tenth International Astronomical Conference which is to be held in Moscow in August 1958 was discussed by the Presidium of the Academy of Sciences USSR.

According to the report delivered by P. G. Kulikovskiy, deputy chairman of the organizational committee, about 900 foreign scientists will attend the conference in addition to those from the Soviet Union. A broad exchange of achievements in the field of astronomy is expected between scientists of different countries. Two symposiums will be held, one on the rotation of the Earth and the other on the relationship between the spectra and luminescence of stars in connection with the problem of their evolution.

Scientific discussions of the results of investigations of solar flares, luminescence of variable stars (the Cepheids), formation of chemical elements in stars, and others are planned for the conference. Of particular interest will be the discussion devoted to astronomical observations with satellites, balloons, and rockets.

A large number of new scientific publications will be presented at the conference. Also, displays of books, photographs, and other materials are planned. (Moscow, Pravda, 24 May 58, and Moscow, Izvestiya, 24 May 58)

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