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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM-- SOVIET-BLOC ACTIVITIES

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Photographing Mechta's Sodium Cloud at the Mountain Astronomical Station

[The following is a full translation of a journal article describing the photographing of the sodium cloud by the Soviet cosmic rocket "Mechta" on 3 January 1957.]

On 3 January 1959, at the Mountain Astronomical Station of the Main (Pulkovo) Observatory of the Academy of Sciences USSR, located near Kislovodsk at an altitude of more than 2,000 meters above sea level, a picture was taken of the sodium cloud which was ejected by the Soviet cosmic rocket.

The creation of such a cloud was specified with the aim of optically determining the coordinates of the rocket. In the sodium cloud under the influence of solar rays there is developed an intense luminescence (resonance fluorescence) of the sodium doublet with a mean wave length of 0.589 μ [5890 Angstrom]. According to calculations made by I. S. Shklovskiy, it is sufficient to disperse only a small amount of sodium (less than one kilogram), in order that the developed luminescence may be registered even with small instrumentation. At a given time and with the aid of a special device, the sodium, in its atomic state, was ejected from the rocket, forming a cloud which in the course of a few seconds attained a diameter of 100 kilometers.

The photographing at the Mountain Astronomical Station was done by special cameras which were fixed on the barrel of a coronograph.

Since the whole luminescence of the sodium cloud was concentrated in a narrow portion of the spectrum, it was possible to use a filter which admitted only these rays. Due to this, the scattered light emitted by the Moon was greatly reduced. (The cloud was observed near the moon.) The use of a filter also caused some difficulties since one does not get a picture of the stars while photographing under such conditions.

To determine the coordinates of the cloud in relation to the stars, additional photographs of the same portion of the sky were taken without a filter up to the beginning of, and after the completion of the observation. The photographing was conducted with photoplates in which every picture, regardless of whether it was taken with or without a filter, carried imprints of marks in fixed places. This permitted us, during later measurements, to "tie in" the position of the cloud to the images of the stars.

At the time that all the photographs were taken the instrument scanned a given portion of the sky with the aid of clock mechanism; thanks to the large dimensions and mass of the coronograph the manipulations of the observations did not cause any displacement of the instrument.

The photograph of the sodium cloud was made possible by the enlargement of a picture to approximately 80 times that of the original. The photoprinting was done slightly out of focus so that with such great enlargement the grain of the photographic emulsion would not be visible, since this would interfere with determining the shape and dimensions of the cloud.

At the moment the rocket was launched everything had been brought to full readiness for photographing at the Mountain Astronomical Station. Photographing was begun several minutes before the flare-up of the cloud and was continued for several minutes later. In the course of this time, 24 pictures were taken, each one with an exposure of 20 seconds.

The coordinates of the cloud, determined by the photograph, closely agreed with what was expected. The brightness of the picture obtained equalled a steller magnitude of approximately 8.5; the angular dimensions were approximately 3' of arc. ("At the Mountain Astronomical Station," by M. N. Gnevyshev, Candidate of Physiomathematical Sciences; Moscow, Vestnik Akademii Nauk, No 5, May 59, pp 99-100)

Hungarian Space Expert Speculates on Latest Soviet Rocket

The following excerpts are from a general discussion on rocket experiments and space travel by Erno Nagy, secretary of the Hungarian Space Navigation Committee, which appeared in Magyar Tudomany, monthly journal of the Hungarian Academy of Sciences.

We know that the 2 January 1959 Soviet space rocket was set in its course at an altitude of 1,500 kilometers and thus its speed could have been 10,100-10,200 meters per second....

It is well known that the combined weight of the instrument section of the first Soviet space rocket and the burnt out part of the last rocket stage is 1,472 kilograms....

If we hypothesize that a four-stage rocket was used to attain the desired speed (which is logical considering that the intercontinental ballistic rocket is two stage and that the artificial satellite rockets are three stage) and if we hypothesize that petroleum-oxygen fuels were used (Soviet rocket technology was developing such fuels earlier) then we can make a fairly reliable estimate of the rocket's size. We might cite the estimate of W. von Braun according to which the Soviet space rocket weighed about 400 tons.

And if we also use a recently appearing official photograph as a basis for our analysis, then the following weights can be assumed: first stage, 300 tons; second stage, 75 tons; third stage, 16 tons; and fourth stage, 9 tons. The burning time of the entire rocket can be put at about 4 minutes, divided as follows: first stage, 2 minutes; second stage, one minute; and the third and fourth stages, half a minute each. In all probability the first three stages used liquid fuel (petroleum and liquid oxygen) but the fourth stage could have been solid fuel. It should be noted that the third stage was a good bit larger than the well known V-2 rocket!...

At this time we cannot speak of actually remote controlled rockets. All the rockets used so far have had the common characteristic that from the moment of take off it was no longer possible to control the movement of the rocket. Built-in and pre-set programmers directed the rocket. The only intervention possible was to blow up the rocket in case of danger....

The first two Soviet artificial satellites forwarded information by means of short wave radio transmissions exclusively. But the third sputnik had a device which recorded data and transmitted them above the home stations in packets [bursts] (in response to query signals) by microwaves. Practically the same system was used in the most recent Soviet space rocket experiment.

The first artificial planet and its fourth stage rocket were equipped with short wave (15 meter) and microwave (1.6 meter) radios. The short wave equipment transmitted coded scientific information as in the earlier artificial satellites; the microwave equipment transmitted in response to a terrestrial query signal.... ("The Scientific and Technical Significance of Space Rocket Experiments," by Erno Nagy, secretary Hungarian Space Navigation Committee; Budapest, Magyar Tudomany, Vol 4, No 3, Mar 59)

II. UPPER ATMOSPHERE

New Book on Meteor Phenomena

A new 640 page book by I. S. Astapovich, Meteornyye Yavleniya v Atmosfere Zemli (Meteor Pehnomena in the Atmosphere of the Earth), was issued by Fizmatgiz in 1958. The book presents, in detail, the history and methods of studying meteors, the results of investigations of the usual telescopic process arising during the motion of meteoric bodies in the atmosphere and also during their penetration in the earth. Among the latter, the formation of meteor holes and craters and hyperseisms. Astronomical data during the flight of meteors, is given, and the basic physical theory of meteors is explained. ("Briefs of New Books"; Moscow, Priroda, No 5, May 59, p 122)

III. METEOROLOGY

Brochure on Aerosynoptic Conditions of Bumpiness on Central Asian Air Routes

A brochure issued by the main Administration of the Hydrometeorological Service under the Council of Ministers USSR, presents the results of aerosynoptic processing of observations conducted by the expedition for the study of bumpy air conditions. The study was conducted jointly with the Central Aerological Observatory Kazakh Scientific Research Hydrometeorological Institute and the Tashkent Geophysical Observatory.

An aerosynoptic classification of the reasons for bumpiness is put forward by the authors and the thermal, orographic, frontal, dynamic bumpiness, bumpiness caused by cold advection, bumpiness caused by "cold pockets" in the troposphere and bumpiness of the jet stream.

The 45 page brochure is designed for forecasters, aerologists, and navigators on aviation staffs.

A bibliography of 19 titles includes eight Western authors. (Aerosynoptic Conditions of Air-Bumping of Airplanes in Central Asia," by V. A. Dzhordzhio, M. A. Petrosyants, and N. N. Romanov; Leningrad, Trudy Sredneaziatskogo Nauchno-Issledovatel'skogo Gidrometeorologicheskogo Instituta, Issue 14, 1958)

IV. OCEANOGRAPHY

Underwater Observations (Skin-Diving) Aid Science

Many means are employed by science to study the depths of the ocean: hydrostats, hydroacoustics, shock tubes for obtaining soils, submarines, etc. The recently acquired Severyanka, the submarine laboratory of the All-Union Scientific Research Institute of the Fishing Industry and Oceanography (VNIRO), is equipped with all necessary apparatus for taking water and soil samples, with sonar, underwater television apparatus, powerful searchlights, and photographic and motion picture apparatus. But all of these devices, instruments, and equipment still do not give the researcher the possibility of setting forth on an underwater scientific expedition for the collection of all the objects of interest to him. This is possible only by the use of skin-diving techniques, when the scientific worker is converted into a man with "aqualungs."

Skin diving equipment for sports and work is being used in the sea and in fresh waters more and more often of late. Such apparatus has special value for the marine biologist in studying depths in the neighborhood of 40 meters where the greatest numbers of plant life and animal forms are encountered.

Among the enthusiasts for this underwater sport, in the USSR, are many scientific workers and students. In the underwater swimming section of the Leningrad Dosaaf /Volunteer Society for Cooperation With the Army, Air Force and Navy/ military-naval club, there are several groups of designers, underwater hunters, and photography and motion picture enthusiasts. Many suggestions for the creation of new types of aqualungs have been introduced by Yu. N. Pozdnyakov and S. N. Korshunov, designers. P. L. Stepanov and N. M. Ginsburg, mechanics, developed the design of an underwater gun. V. I. Kebkalo and Yu. V. Vasil'yev, made a waterproof box for photographing underwater. Many members of the section take part in different scientific research and prospecting expeditions.

The Chair of the Physics of the Sea and Inland Waters of the Moscow State University imeni M. V. Lomonosov, created a group of young scientific workers for studying the techniques of the underwater sport. Here, work on developing improved designs of aqualungs is conducted, waterproof containers for submarine photography are developed, and lectures are given on the physiology and pathology of skin-diving.

Skin-diving equipment made in the USSR makes use mainly of compressed air and not oxygen. The "Podvodnik DOSAAF-1" and "Podvodnik DOSAAF-2" skin diving apparatus which was created under the direction of A. I. Soldatenkova, the designer, merits attention. These apparatus have cylinders, automatic lungs with breathing tubes and mouthpieces, reducing valves, straps for fastening the apparatus to the back, masks and fins. The air in the cylinder is compressed to 150 atmospheres. The production of the "Ukraina" skin-diving equipment (A. S. Gnamm, designer-engineer) has been started by the Lugan' Sovnarkhoz. This equipment consists of the following units: a high-pressure type automatic lung and a minimum pressure gauge with a sound warning signal; two 4-liter capacity cylinders, each with an operating pressure of 200 atmospheres; panels for mounting the units of the apparatus and a system of straps for fastening it to the diver's back; bellows hoses and a ball valve with a connecting sleeve permitting the use of either a mouthpiece or the "ShV-4" head mask.

The task in the USSR now is to organize the series production of various types of light-diving sportsman's equipment; aqualungs, underwater guns with spare harpoons or spears, fins, waterproof boxes for photographic and motion picture apparatus, portable depth meters and fathometers, floating knives, and other equipment. There is also the need for perfecting the production of protective clothing, such as is widely used abroad, which permits swimming even in icy water.

There is no doubt that very shortly light diving equipment will become a necessary part of the equipment of the marine biologist and geologist. The detailed geographic study of Soviet seas and fresh waters, the problem of their economic use is now unthinkable without employing prospectors of the "deep continent" for this purpose.

More frequently, underwater sportsman are participating in the most varied oceanological investigations. They are the main assistants of fishermen and the leading detachments of the life saving service. They render great aid in hydraulic construction.

Skin divers have also been used in archaeological operations conducted in the Black Sea, Lake Chudskoye, and the Dnepr River.

For several years, the Laboratory of Aeromethods Academy of Sciences USSR has been investigating the bottom of the Black Sea, the Azov and Caspian Seas. These studies were conducted by B. I. Koshechkin and K. M. Petrov, scientific workers, under the supervision of V. V. Sharkov, senior scientific associate. These operations were of great help in the compilation of maps, in more accurately determining the distribution of water vegetation, and in the finding of mineral resources on the bottom of the sea.

The Pacific Ocean Expedition of the Institute of Biophysics Academy of Sciences USSR, conducting operations in the Sea of Japan, in its complement, had a special group of experienced underwater swimmers. These rendered great assistance to the hydrobiologists, and surveyed conditions of underwater sport in the Pacific Ocean. During the underwater observations, about 2,000 meters of colored motion picture film were taken.

The Chair of Water Management and Maritime Ports of the Moscow Engineering Construction Institute imeni V. V. Kuybyshev, inspecting underwater hydraulic construction in Novorossiysk, Sochi, and Tuapse, used underwater observers and aqualungers for this purpose.

The locations most suitable for underwater hunting in the USSR are the Black, Azov, Aral, and Caspian Seas. The Sea of Japan is also suitable for this. The low temperatures of the waters in the Baltic and the northern seas hamper these activities.

Underwater motion picture photography was widely used in the making of several Soviet films, the most notable of which was "In the Pacific Ocean," made by the Moscow Studio of Popular Science Films, which won a special prize at the First All-Union Motion Picture Festival Held in Moscow in 1958.

Soviet industry puts out a great number of different photographic apparatus which can be adapted for underwater use. One is the 16 millimeter amateur motion picture camera "Kiev - 16S-2." Made of light strong metal, the camera is 21.5 x 13 x 6.5 centimeters in size and weighs 1,700 grams. Turret construction ensures quick change of its two objectives. Also on the market is the Czechoslovakian motion picture camera "Admira," intended for 16-millimeter film (2 x 8 millimeters). The "AK-8" and "Pentaka" cameras from East Germany have also attained wide distribution.

The wide development of skin-diving and underwater sport in the Soviet Union opens a new and promising perspective. A great army of underwater sportsmen is available to aid marine biologists, geologists, hydrogeologists, archaeologists, and other specialists. These sportsmen are truly assistant scientists and not in the sport for the thrill alone. It is deemed important now, to establish very close, friendly ties between scientific organizations and the sections of Dosaaf underwater sport clubs and the various institutions. It is also necessary for the scientists themselves to master the technique of skin diving, to study underwater hunting and underwater photography and motion picture making. The creation of a laboratory of underwater investigatings in one of the scientific research institutes of the Academy of Sciences USSR would also be of great value.

A camp for sportsmen-divers has already been established in the south of the USSR. A similar camp has also been created on the Pacific Ocean. Here the divers are trained, hunt underwater, and take photographs and motion pictures. It is considered necessary to create special schools for underwater sports. The problems involved in this matter are considered very essential and it is felt that they must be solved as quickly as possible. ("Underwater Observations -- in the Service of Science," by Yu. P. Znamenskiy, Leningrad; Moscow, Priroda, No 5, May 59, pp 102-106)

Study of Deep Ocean Currents During Vityaz' Expedition

During the preparation for work in connection with the IGY, the Institute of Oceanology of the Academy of Sciences USSR worked out, for measuring deep currents in the ocean, a method employing anchor buoy stations with automatic current recording devices attached to the cables. The buoys were made of light weight (400-600 kilogram buoyancy) foam plastic and were equipped with radar targets operating on a given program for search by ship. Graduated (6.0 - 3.5 millimeters) cables were used to anchor to buoys in depths of up to 6.5 km.

Using the cable buoy stations and the automatic current recorders (BPV), in August 1958, an expedition aboard the Vityaz' conducted a series of current measurements at depths of up to 1,500 meters in the Pacific. The length of service of one station during this time was 11.5 days; this station performed in the southern periphery of the Kuroshio Current [also known as Japan on Black Current] in the region of an underwater elevation at a depth of 2,600 - 2,700 meters. The station obtained data on the velocity and direction of flow at the 8-, 100-, 250-, 750-, and 1,500-meter levels. A graphic of the progressive flow vectors observed for the period 21-24 August 1958 shows that, in spite of the supposed insignificance of currents at depths of 1,000 meters and more, there are currents at these depths which move at a rate of 25 centimeters per second. Currents of more than 0.7 meters per second were recorded at the surface of the ocean at the same time.

A raw processing of the observation data showed a division of currents into inflow-outflow and steady currents. For the 8-10 meter level in the period of measurement (16-27 August 1958) the directions of the steady currents varied from 47°-107°, and the rates of flow from 32 to 49 centimeters per second.

The variability of steady currents at depths of 8-10 meters over the 12-day period in the surveyed region shows the presence of a relatively stable and considerable movement of water toward the east, but not toward the south, as should be the case according to charts of the Morskoy Atlas (Atlas of the Sea) [Leningrad, 1950]. Here, during the 12-day period, a movement of water in the direction of 89° at a rate of 37.5 centimeters per second was observed.

In relation to flows caused by other factors, the inflow-outflow current at depths of 100-750 meters account for a total of 5-10 percent of the observed values. In the surface layer the comparative values of the periodic currents increase, reaching as much as 30 percent. Even larger comparative values were observed for the inflow-outflow currents at depths of 1,500 meters, where they amount to 50 percent of those observed. The ratios of the periodic to stationary currents observed at the buoy stations are apparently characteristic of these regions of observation only, and for other places in the ocean they have other values. On September 1958, in regions adjacent to a point 39 degrees north latitude and 153 degrees east longitude, currents on the order of 6-8 centimeters per second were observed at depths of 1,000 - 1,500 meters, when there were considerable flow velocities (approximately 15-20 centimeters per second) at depths of 10-100 meters. ("On Currents in the Ocean," by N. N. Sysoyev, Institute of Oceanology, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 5, 11 Apr 59, pp 1123-1125)

V. GLACIOLOGY

Present Glaciation in the Zangezurskiy Mountain Range

The southernmost point of modern glaciation in the Caucasus occurs in the southern part of the Zangezurskiy mountain range, just north of the 39th parallel. The range, highest in the Malyy Kavkaz, is second only to the Glavnyy Kavkaz range in height. It lies southeast of the Armenian highlands and extends 150 kilometers, from the mountain of Ginal (Shakhdarskiy Range) in the north to Araksa in the south. The altitude of the range in the region of glaciation reaches 3,700-3,900 meters.

The perpetual snows in the Zangezurskiy range are in the form of small corrie-glaciers and firn snows, which are found on the eastern and western slopes of the mountain, from Gazangel'dar (3,829 meters) in the north to Saridara mountain (3,750 meters) in the south. Judging by the altitude of the occurrence of the majority of glaciers, the present snow line on the Zangezurskiy range is at an altitude of 3,600-3,650 meters.

The principal mass of glaciers here is located in the shaded places, in the various depressions, fissures, hollows, ravines, and in crumbled and half-ruined corries, and it, in an almost continuous chain, in stages of ones and twos, extends along the eastern and western slopes of the range. The bottoms of many cirques in the lower formation contain small lakes, and in the cirques composing the upper formation, near the ridge of the mountains, lie the glaciers and snow fields.

According to the latest topographical map, in the 22 kilometer stretch of the Zangezurskiy range limited by the above-mentioned peaks, 52 glaciers and snow fields can be counted, the total area of which is 1.58 square kilometers. Of these 44 glaciers are on the eastern slope and 8 on the western. All of the glaciers are located higher than 3,400 meters above sea level.

The largest glaciers are located in the southern half of the indicated part of the range. Here, eight corrie glaciers with a total area of 0.68 square kilometer are found. All of these are small spots of firn with an area of several hectares. At the lower limits of these glaciers, the numerous sources of the Megriget River begin.

In the northern half of the range, smaller glaciers, 1-2 hectares in size, are observed, and concentrations of them occur at the sources of the Pyardchay, Kapidzhikhchay, and Yagulchay rivers.

The existence of glaciers in the Zangezurskiy range was known long ago, but their quantitative and qualitative characteristics were not determined earlier because there were no sufficiently detailed topographic maps of this region. Now, after the completion of large-scale mapping, this blank can be considered filled. ("Present Glaciation of the Zangezurskiy Range," by P. I. Ivan'kov, Candidate of Technical Sciences, Moscow; Moscow, Priroda, No 4, Apr 59, p 114).

VI. SEISMOLOGY

Seismic Studies of Earth's Crustal Structure Under the Black Sea

In September 1957, under the direction of N. N. Sysoyev, the Black Sea Experimental Scientific Research Station of the Institute of Oceanology of the Academy of Sciences USSR conducted seismic studies in the region of the Black Sea to the southwest of the Crimean peninsula. The results of these measurements were used as a basis for a determination of the structure of the earth's crust under the Black Sea. In addition to the author, of this article, Yu. P. Neprochnov, V. P. Goncharov, G. N. Shchipletsov, M. F. Mikhno, and others took part in the work afloat, and A. F. Neprochnova helped to process the data.

The method employed for the seismic measurements was that of wave refraction, whereby charges weighing from 0.4 of a kilogram to 130 kilograms were detonated and recordings made by the experimental ships "Akademik Vavilov" and "Akademik Shirshov." Because of the limited seaworthiness of the "Akademik Shirshov," only the "Akademik Vavilov" was used as a recording ship for offshore; the recording method used involved recording at two (usually end) points of the profile and shifting the point of detonation, a method found profitable earlier by US seismologists (M. Ewing, et al., Bull. Seismol. Soc.Am., Vol 50, No 3, 1950).

The data obtained, when compared with published results of determinations of the structure of the crust of continents and of oceans, showed that the earth's crust under the Black Sea to the southwest of the Crimean peninsula is essentially different from the continental, as well as the oceanic, type. In this region, the crust is 22-24 kilometers thick, i.e., thinner than that of the continental and thicker than that of the oceanic regions. The absence of the boundary layer makes the crust under the Black Sea similar to the oceanic type, but its sedimentary stratum is considerably thicker (8-12 kilometers). The crust structure is quite similar to that of the crust under the Gulf of Mexico (M. Ewing et al., Geophysics, Vol 20, No 1, 1955), where, with a general thickness of the crust of about 20 kilometers, there is a thick sedimentary layer of cap rock with a seismic velocity of 6.2-6.4 kilometers per second.

The seismic data revealing the presence of a thick sedimentary layer under the Black Sea confirms earlier statements of Arkhangel'skiy and Strakhov (Geologicheskoye Stroyeniye i Istoriya Razvitiya Chernogo Morya /Geological Structure and History of the Development of the Black Sea/, Moscow 1938), who classified the deep-water depression of the Black Sea as a typical geosyncline which is still sinking. On the basis of data on the geology of contiguous areas, M. V. Muratov (Byull. MOIP, otd. geol., Vol 30, No 5, 1955, p 27) computed the probable thickness of the sedimentary stratum of the deep-water depression of the Black Sea

as 7-8 kilometers. The seismic investigations discussed here showed a somewhat higher value, there being an increase of the thickness of the sediments in the southern and southwestern directions. ("The Depth Structure of the Earth's Crust Under the Black Sea Southwest of the Crimea According to Seismic Data," by Yu. P. Neprochnov, Institute of Oceanology, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 5, 17 Apr 59, pp 1119-1122)

Problem of Tsunami on USSR Pacific Shoreline Discussed

The problem of studying tsunami (storm wave), says A. Ye. Svyatlovskiy, Candidate of Geological-Mineralogical Sciences, of the Laboratory of Volcanology, Academy of Sciences USSR (Moscow), should be included in a number of international oceanological problems, and the exchange of the results from scientific investigations on tsunami between interested countries should be promoted. These natural calamities, which embrace the Pacific shores of many countries, are caused principally by tectonic earthquakes occuring on the bottom of the sea. In rare cases, they arise as a result of volcanic eruptions.

In the region of Pacific Ocean shores of Kamchatka and the Kuril Islands, scenes of frequent tsunami, the need for an early warning system similar to present Japanese methods of seismic forecasting and tsunami notification exists. With these methods, says Svyatlovskiy, USSR seismic stations will be able to predict the coming of a tsunami by about 20-30 minutes. It is also possible to forecast tsunami with the aid of recordings by hydroacoustical instruments of sound waves excited in the ocean during seaquakes and the processes of changes in the relief of the ocean bottom. Sound waves (Phase T) being propagated in water for great distances, having a velocity of 1,500 meters per second, reach shores considerably earlier than the tsunami. Hydroacoustical methods of forecasting are of special value for studying tsunami arising during submarine volcanic eruptions since the latter are not always accompanied by earthquakes. Finally, recordings of fluctuations in sea level after strong earthquakes play a large role in warning of tsunami, confirming the danger of the approaching catastrophe.

The organization of a tsunami warning service for the shores of Kamchatka and the Kurile Islands is the important problem of the very near future. Inasmuch as tsunami arising in the regions of seaquakes envelope definite parts of the seashore, warning stations must have the possibility of operating independently of each other within the limits of their own threatened region.

Together with the organization of a special service for tsunami warning, special measures must be carried out for warnings of the natural calamities in the regions subjected to tsunami danger. Special regioning of the shore will permit the determining of the parts of the shore suitable for building of enterprises and villages and, in varying degrees, the possibility of danger.

Such regioning is based on the comparison of data concerning the location of the epicenters of strong seaquakes with the depth and bottom relief of the ocean and the configuration of the adjacent seashores. In addition, the height of large tsunami occurring in a specific region can be calculated. On the basis of the known relationship between the height of the wave, the depth of the ocean, and the relief of the coastal belt, it is possible to calculate the height of the tsunami at different shore points with different locations of the earthquake epicenters. In planning populated areas, after comparing these data with the actual height of tsunami which have been established for certain shore points, it is necessary to compile large-scale maps of those parts of the seashore suitable for building purposes and to delineate the zones of possible flooding by tsunami by means of isolines. ("Tsunami of the USSR's Pacific Ocean Shores," by A. Ye. Svyatlovskiy, Laboratory of Volcanology Academy of Sciences USSR; Moscow, Priroda, No 4, Apr 59, pp 93-97)

VII. ARCTIC AND ANTARCTIC

Expedition Studies Asymmetric Forces in Arctic

An air expedition of the Arctic and Antarctic Institute recently returned to Leningrad. Under the guidance of V. G. Kanaki, experienced polar scientist, the expedition members distributed a number of drifting radio-meteorological stations on the ice of the Arctic Basin.

For the period of about one month, N. A. Kozyrev, Doctor of Physico-Mathematical Sciences and astronomer at the Pulkovo Observatory, worked with this expedition in the Arctic. Together with his assistant, V. G. Labeysh, he was engaged in measurements of the asymmetric forces acting on the surface of the Earth. The existence of these forces, as had been premised by N. A. Kozyrev, is caused by the interrelations between different masses of the Earth which are in relative rotation.

On his return to Leningrad, N. A. Kozyrev told a correspondent of Leningradskaya Pravda that the results obtained by the expedition, as well as measurements previously made in temperate zones, are definite proof of the fact that such asymmetric forces exist. It had also been assumed previously that there is a parallel on which asymmetric forces do not exist. This theory has likewise been confirmed. The instrument used for the observations, i.e., the "scales" built by the Pulkovo Observatory, did not reveal any asymmetric forces in one of the points south of Ostrov Dikson.

In the future, it is planned to conduct such observations also in Antarctica. ("In 20 Points of the Arctic," Leningradskaya Pravda, 5 May 59)

New Drift Station In Operation

Over a month has passed since the high-latitude expedition "Sever-11" selected an ice floe for the new scientific station Severnyy Polyus-8. During this period, the drifting ice floe has covered a distance of more than 240 kilometers, describing a small loop. Moving in a general north-northwest direction, the ice floe has traveled a distance of only 110 kilometers and has crossed the former route of the drift station Severnyy Polyus-2.

According to all available data, the station Severnyy Polyus-8 will drift in the region of anticyclonic circulation bordering on the Pacific Ocean. It will apparently drift approximately along the route of drift of Severnyy Polyus-2. In a few year's time, the ice floe, where the Soviet scientists are now working, will return to the area from where it started its drift in April 1959.

Not one scientific station has, thus far, fully completed its drift in the region of anticyclonic circulation adjoining the Pacific Ocean. That is why this part of the Arctic Ocean, bordering on the Canadian Archipelago, is still little explored. The station Severnyy Polyus-8, headed by V. Rogachev, will be conducting research in this area, especially in an attempt to check the theory of the existence of a permanent anticyclonic circulation adjacent to the Pacific Ocean.

Over 130 tons of scientific equipment, food, fuel, etc. were flown to the new drift station. Daily weather reports have been transmitted to the mainland by radio since the very first day the station began to operate. L. Belyakov and V. Uglev, oceanologists, are conducting hydrological research. Recently they took the first depth sounding in the area of the drift. A magnetic and aerological pavilion is being equipped.

On 30 April, the ice floe broke up next to the camp. The crack passed very close to the huts, separating the meteorological observation platform and part of the equipment from the rest of the camp. The camp had to be moved to another site, further away from the crack, and it has now been re-established at the new location. ("Far Away, On The Ice Floe...," Moscow, Vodnyy Transport, 30 May 59)

Documentary Arctic Film Presented to Journalists

As previously reported in the press, a large group of Soviet and foreign journalists took part in a flight covering the route Moscow-North Pole-Moscow during November and December 1958, at which time they visited the drift station Severnyy Polyus-7.

Everything the correspondents saw in the Arctic during this flight has been recorded in a documentary film entitled "With Their Own Eyes." The film, produced by operators of the Central Television Studio in cooperation with the journalists, has been viewed with great interest by the public.

On 20 May, the journalists who had taken part in the flight were presented with souvenir copies of this film as a friendly gift to the editorial boards of newspapers and periodicals, information agencies, and radio organizations who sent their representatives on this trip. ("Documentary Film on the Arctic," Moscow, Izvestiya, 22 May 59)

Part of Antarctic Coast Is Remapped

Members of the Fourth Soviet Antarctic Expedition explored the ice shelf in the region of Princess Astrid Coast, where the station Lazarev was established. According to Captain A. I. Dubinin of the Ob', the Soviet explorers spent more than one day searching for the ice shelf, which was indicated on the map as being between 11 and 14 degrees E. Actually, however, the ice shelf was located 50 miles further east.

After the Ob' had stayed at Princess Astrid Coast and the expedition members had conducted exploration at this location, a new, revised map of this region was compiled. A number of new names of geographical objects have appeared on the map. Many of them bear the names of Russian scientists and navigators. ("New Explorations in Antarctic," Moscow, Vodnyy Transport, 12 May 59)

Temporary Scientific Station in Antarctica

A new, temporary scientific station was recently established on Drygalski Island, located in Davis Sea, 50 miles north-northeast of the Pravda Coast. The island is 20 kilometers long and 13 kilometers wide. Its coordinates are 65 45 S and 92 28 E. Since 1956, Soviet scientists have been conducting sporadic observations on this island.

Scientific workers, equipment, two dog-sled teams, etc. were transported to the island from Mirnyy by a LI-2 airplane, making three round trips. Observations on the island have been started by A. Kapitsa, glaciologist; N. Medvedev, magnetologist; Yu. Durynin, seismologist; L. Khrushchev, astronomer-geodesist; and A. Krasnushkin, physicist. They will conduct complex glaciological research, seismic, gravimetric and magnetic surveys, and meteorological observations and will carry out a complete cycle of geodetic work.

A. Kapitsa, Candidate of Geographical Sciences, a member of the First Antarctic Expedition, was one of the first to start glaciological research on this island in 1956. He completed a series of seismic soundings of the ice which indicated that the island is a large block of ice with a regular cupola-shaped form. It rests on a sandbank of Davis Sea, above which the water has a depth of 100-150 meters. The ice in the center of the island is 420 meters thick. At the same time, the ice shelf rises only 286 meters above sea level. The results of measurements have shown that the surface of the bank is flat, without any elevations in the central part of the island. The edges of the island represent steep cliffs, rising 150 meters above the surface of the bottom, with a visible elevation of about 30-35 meters above sea level.

As suggested by Soviet scientists, islands similar to Drygalski Island should be called "ice island-cupolas" to distinguish them from the "ice caps," since the structure of the latter must contain a core consisting of basic rocks.

Constant radio contact is maintained between the station on Drygalski Island and the Mirnyy observatory. During the past few days, a heavy snowstorm was raging on the island. The wind velocity reached 35 meters per second, and the air temperature was between minus 22 and minus 8.5 degrees centigrade. ("On An Ice Island," Moscow, Vodnyy Transport, 26 May 59)

Czech Scientist Returns From Antarctic

The Czech scientist Antonin Mkros, who worked in Antarctica since the end of 1957 as a member of the Third Soviet Antarctic Expedition, returned recently to Prague. He spent 19 months in the Antarctic. During this period, A. Mkros collected a large amount of valuable scientific data, which are to be processed gradually by the Czechoslovak Academy of Sciences.

Durin his voyage to Antarctica on the Soviet ship Kooperatsiya, A. Mkros conducted meteorological and oceanographical observations. Upon his arrival in Mirnyy, he began to conduct observations of the luminescence of the evening and night sky. Later, Mkros took part in a 3-month expedition into the interior of the continent, during which he conducted meteorological observations and worked as a navigator of the sled-tractor train.

The Czech scientists also took part in the construction of the new Soviet station Lazarev, established in a hitherto little explored region of Antarctica, and in a geological expedition which discovered a new mountain area, named the Russian Mountains. The data collected by A. Mkros are of great interest for the study of processes occurring in the upper atmosphere. ("19 Months in Antarctica," Moscow, Izvestiya, 20 May 59)

Soviet Doctor Flies to Aid of Australian Scientist

The Australian antarctic station Wilkes is about 800 kilometers east of Mirnyy. The Australian scientists had sent a request for medical aid to the Soviet Antarctic Expedition on behalf of one of their associates at the Australian station, who was seriously ill. Early in the morning of 3 May, a Soviet plane took off from Mirnyy. In addition to the crew, it carried Doctor Kosachev and interpreter Lugovoy.

During the flight above the ice cap, the plane got into very bumpy weather. At 1015 hours Moscow time, the Soviet plant landed at the station Wilkes. ("To the Aid of the Australians," Moscow, Pravda, 4 May 59)

Station Lazarev in Operation

Three months have passed since complex scientific research was begun at the station Lazarev on Princess Astrid Coast. A laboratory for glaciological research has also been set up at this location.

Recently, two icebergs broke off from the ice shelf on which the station is located and drifted slowly westward.

Frequent magnetic storms make it difficult to maintain radio contact with Mirnyy and Vostok, at the south geomagnetic pole. ("Polar Workers Report by Radio," Moscow, Vodnyy Transport, 2 Jun 59)

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