

CIA/PB 131632-125

Approved For Release 2001/08/08 : CIA-RDP80-01100A00025000-4

~~UNCLASSIFIED~~ INFORMATION ON SOVIET  
BLOC INTERNATIONAL GEOPHYSICAL COOPERATION  
- 1960

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INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1960

July 1, 1960

U. S. Department of Commerce  
Business and Defense Services Administration  
Office of Technical Services  
Washington 25, D. C.

Published Weekly  
Subscription Price \$12.00 for the 1960 Series

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

PB-125

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INFORMATION ON INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM --

SOVIET-BLOC ACTIVITIES

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Review of Article and Book by B. Danilin, Candidate in Technical Sciences

The following are brief excerpts from a full-page article in the popular-consumption journal Nedelya. The author is B. Danilin, the author of the book that is reviewed below:

CPYRGHTT "A new step has been taken toward the accomplishment of a manned flight into space. Instead of a satellite with only a small airtight cabin, we have put a giant spaceship into orbit; its cabin alone weighs more than 2.5 tons.

"In respect to satellites capable of carrying a man, the most optimistic computations of American scientists indicate that the test launching of such satellites can be accomplished in that country no sooner than in 1961. Moreover, they are talking about a cabin that will weigh only 980 kilograms. We may recall that our spaceship, put into orbit on 15 May, had a total weight of 4.5 tons and carries a cabin weighing 2.5 tons.

"Besides the equipment insuring an uninterrupted regeneration of air, absorption of carbon dioxide and excessive vapor, the cabin must have a reserve supply of oxygen for use in case of loss through leakage. Within the cabin there should be special instruments automatically regulating temperature, humidity, gaseous composition and air pressure. Another group of instruments should provide the cosmonaut with information about flight conditions and course correction for the spaceship.

"The immense velocities of flight and the colossal distances of interplanetary travels substantially limit the possibilities of a man in his role as a pilot on a spaceship. The speed of a man's reaction to a change in surrounding conditions requires no less than 1.5 seconds; during this time the spaceship will travel 12 to 15 kilometers. Moving at such an immense velocity, a man cannot react in time to the appearance of a large meteor in order to change the course of the spaceship.

"At great heights the direct rays of the Sun are not attenuated, they are almost unscattered. This leads to sharp contrasts between the shaded and lighted surfaces. The absence of ordinary points of orientation gives no sensation of depth and makes it impossible for a man to estimate sizes, distances and the relative velocity of other bodies." ("The Great Road Ahead," by B. Danilin, Nedelya, No. 12, 15-21 May 1960, p. 2) CPYRGHT

The following is a brief report on a small book written by B. S. Danilin. It is entitled "The Beginning of the Space Era" (Nachalo Kosmicheskoy Ery), is 47 pages long, and was published by the All-Union

Society for the Dissemination of Political and Scientific Knowledge. It carries a publishing date of 1960, was printed in 26,000 copies, and sells for 75 kopecks. It is part of a popular series issued by this publishing house.

The book is divided into the following sections: "The First Reconnoiterers of Space," "The First Artificial Satellite of the Sun," "The First Cosmic Rocket," "The First Automatic Interplanetary Station," "The American Satellites and Rockets," "At the Boundary of the Atmosphere," "The Earth's Corona and Mysteries of the Magnetic Field," and a concluding section "There Is No Limit to Daring."

This is a compact, well written and popular presentation of the subject treated. It is a straightforward presentation without inclusion of extraneous material or wasted words. Its scientific and technical content has not been evaluated. ("The Beginning of the Space Era," by Boris Stepanovich Danilin, Izdatel'stvo Znaniye, 47 pp., ill., Moscow, 1960)

"Nauka i Zhizn'" Publishes Fascinating Popular Article on Flight to the Stars

The popular scientific periodical Nauka i Zhizn' has published a highly interesting 3,000 word article dealing with problems associated with a flight to the stars.

The authors, V. A. Bronshten and I. D. Novikov, members of the Council of the Moscow Division of the All-Union Astrogeodetic Society, point out that such a flight is impossible except by means of the so-called photon rocket. The principle of such a rocket is then described. They indicate that the technical problems associated with the construction of a photon rocket are still unsolved -- but they believe that a photon motor can be developed and give the rocket a velocity close to the speed of light.

A large part of this article is devoted to a discussion of the theory of relativity as operative during a flight to a distant star; the explanation is on a level suitable for the popular audience to which it is directed.

The titles of the sections of this article are a clue to the over-all contents: Into the Cosmos -- On Rays of Light; Is It Possible to Fly Faster Than Light?; What is Shown by the Theory of Relativity; Travel Into the Future; The Universe From the Window of a Starship; The Paradox of Time; We Fly to Proxima Centauri; To the Nebula Andromeda; When Will This Be? ("Flight to the Stars," by V. A. Bronshten and I. D. Novikov, Nauka i Zhizn', No. 4, 1960, pp. 58-64)

II. UPPER ATMOSPHERE

Abstract of an Article on Advanced Soviet Research on the Earth's Magnetic Field

A 4-page article in a recent issue of the Doklady of the Academy of Sciences of the USSR is entitled "Fluctuations of the Magnetic Field and of Current Density in the Turbulent Flow of a Poorly Conducting Liquid." The author is G. S. Golitsyn of the Institute of Physics of the Atmosphere of the Academy of Sciences of the USSR. This article is devoted to the complex problem of computation of the spectrum of the fluctuations of the magnetic field and of the spectrum and structural function of the density of the induced currents.

Readers of the Journal of Geophysical Research will recognize Golitsyn as the author of an article in Vol. 64, No. 12, December 1959, which forms part of the International Symposium on Fluid Mechanics in the Ionosphere. ("Fluctuations of the Magnetic Field and Current Density in the Turbulent Flow of a Poorly Conducting Liquid," by G. S. Golitsyn, Doklady Akademii Nauk SSSR, Vol. 132, No. 2, 1960, pp. 315-318)

Report on the Falling of a Meteor in the Azerbaydzhan SSR

The following is a summary of an article appearing in the Izvestiya of the Academy of Sciences of the Azerbaydzhan SSR (Geological-Geographical Series):

At 0805 hours local time on 24 November 1959 an iron meteorite fell in the Yardymly rayon of the Azerbaydzhan SSR. Individual parts of the meteorite have been found near the villages of Arus, Zhiy, and Kergedy; the meteorite had exploded in mid-air.

The Presidium of the Academy of Sciences of the Azerbaydzhan SSR organized an expedition for the study of the circumstances of the fall and questioned witnesses; the expedition was on the spot from 27 November through 11 December 1959. The collected material is being subjected to further investigation in the laboratories of the institutes of the Academy.

It has been possible to ascertain the following on the basis of research at the site of the fall and by questioning of a large number of witnesses.

There were very unfavorable meteorological conditions on the day the meteorite fell. The entire region was covered by a thick fog and the cloud cover hung low. A small amount of snow had fallen a few days earlier. For this reason the witnesses were unable to tell us about the flight of the fire-ball, about the point at which it disintegrated, or about its trail, size, form or color. They were only able to report the sudden appearance of a blindingly bright flash.

Despite the presence of the thick fog, the flash lit up a rather large area, with a radius no less than 30 km. Pronounced acoustic phenomena were observed at the time of the falling of the Yardymly meteorite. A sound resembling that of thunder was heard for a period of 5 to 6 minutes for a distance of more than 60 km.

Between 24 November and 5 December 1959 five meteorites were found in the Yardymly rayon. They weighed as follows: 11.3 kg, 5.7 kg, 5.93 kg, 360 g, and 127 kg.

On the basis of the information collected from the residents of Yardymly rayon and the surrounding area, and on the basis of our investigation of the sites at which the five meteorites fell, the following preliminary conclusions may be drawn:

1) Before disintegration the meteorite moved in a direction from southwest to northeast on an azimuth of 225-230°. Confirmation of this is the orientation of the sites at which the meteorites fell; they are oriented from southwest to northeast. It may be added that the angles at which the meteorites struck the surface are rather great -- 60° in one case and 80-85° in the other cases.

2) Although the flight of the fire-ball was not directly observed, on the basis of the great radius of visibility of the light flash and the audibility of the sound effect we may conclude that the disintegration of the meteorite occurred at a relatively great height (10 to 20 km).

3) The disintegration of the meteorite occurred between the villages of Yardymly and Arus, in any case, to the southwest of the point at which three of the meteorites fell.

4) There is a great probability of finding several other meteorites.

5) The ellipse in which fragments were scattered would appear to be 8 x 1.5 km in size, with its larger axis oriented from southwest to northeast (see map, not reproduced here).

6) The Yardymly meteorite is a typical iron-nickel meteorite but with the original coalescence of minerals and numerous inclusions of graphite.

7) In the direction of meteorite travel they have a conical shape, a smooth surface, and are covered to a considerable degree by a black layer as a result of fusing; at the opposite end the meteorite is granular.

At the present time work is continuing in the scientific institutions of the Academy of Sciences of the Azerbaydzhan SSR on the study of the meteorite, including its morphological, structural and geochemical properties, its mineralogical and chemical composition, its residual magnetism, etc.

With our current interest in the mastery of space the scientific study of meteorites such as the Yardymly meteorite is becoming of extraordinary interest. Meteorites are the only form of matter arriving at the Earth's surface from outer space and serve as a key

to the unravelling of many natural phenomena; they supplement the information which we have gained from the first artificial earth satellites and cosmic rockets. ("On the Falling of the Yardymly Iron Meteorite," by M. A. Kashkay, G. F. Sultanov, T. A. Eminzade and V. I. Aliyev, Izvestiya Akademii Nauk Azerbaydzhanskoy SSSR, Seriya Geologo-Geograficheskikh Nauk, No. 1, 1960, pp. 169-174)

### III. METEOROLOGY

#### Meteorological Report on Atmospheric Fronts in Western Antarctica

The following is the substance of a Soviet report appearing in the May 1960 issue of Meteorologiya i Gidrologiya.

As we accumulate new facts about the development of atmospheric processes over the interior continental regions of Antarctica the nature of the changes in weather in those regions is becoming increasingly less mysterious although the general picture and many details of weather formation still remain unclear.

Three circumstances make it impossible for weathermen to analyze processes over the continent with the same degree of assurance as it is done for the coastal regions of Antarctica: 1) an ignorance of the orography of the region; 2) an absence of a sufficient number of meteorological stations on the continent; 3) the existence of a permanent deep near-surface inversion which makes synoptic maps almost useless for the solution of analytical problems.

There is too little aerological data for the solution of a number of problems of Antarctic meteorology, including problems in the prediction of weather.

It has seemed important to establish whether weather changes in the interior continental regions are of a frontal character or not. During the winter of 1958 more than a few data were accumulated on the basis of which we may draw the preliminary conclusion that the principal weather changes on the plateau around the pole do have a frontal character. At the same time it must be noted that there are a number of things that are unclear in this frontal interpretation of atmospheric processes over Antarctica.

At the same time it is difficult to dispute the reality of the existence of atmospheric fronts and their influence on the weather of the interior regions of Western Antarctica.

The article gives a detailed description of processes in Western Antarctica during the period 25 July through 31 July 1958; Figure 1 is a vertical cross section of the atmosphere over the station Amundsen during this period. Fronts are so obvious that there can be no question of their existence. In this period the two atmospheric fronts that are described in some detail are not the only ones discernible,



others were present, especially aloft, as described in the final paragraphs of the text. ("Concerning Atmospheric Fronts in Western Antarctica," by P. D. Astapenko, *Meteorologiya i Gidrologiya*, No. 5, 1960, pp. 23-26)

Abstracts of Articles from the Latest "Meteorologiya i Gidrologiya"

(a) The Spectral Albedo of Natural Underlying Surfaces

This 3,000 word article, 8 pages in length, points out that the investigation of the spectral albedo of natural underlying surfaces is still in its initial stages; there is a great need for a substantial improvement in the methods of measurement and long-range accumulation of experimental data before the reflective properties of natural underlying surfaces have been well studied. Of exceptional interest is the problem of the albedo in the infrared region of the spectrum -- a problem that has remained almost totally unstudied.

The various kinds of underlying surfaces are considered -- soils, barren lands, vegetation, snow and water. The article represents a review of our existing knowledge of this subject, not an original or specific contribution.

The bibliography is made up of 31 items (all referenced in the text); there are 2 tables and four graphs. ("The Spectral Albedo of Natural Underlying Surfaces," by K. Ya. Kondrat'yev, *Meteorologiya i Gidrologiya*, No. 5, 1960, pp. 46-53)

(b) On the Influence of Condensation Heat Release on Vertical Currents

The methods and equations proposed in this 8-page article make it possible (for a given thermobaric field in the atmosphere) to compute the momentary values for vertical velocity and condensation in a cloud -- provided that we know the boundaries of the cloud  $b_1$  and  $b_2$ . It should be remembered, the author warns, that  $b_1$  and  $b_2$  may change during the prediction period. Therefore in order to use this method for prognostic purposes it is necessary to have a further development of the numerical prediction of the height of the cloud cover. A knowledge of change in the height of the cloud cover makes it possible to predict precipitation in much the same way as for the numerical prediction of pressure. ("On the Influence of Condensation Heat Release on Vertical Currents in the Atmosphere," by R. L. Kagan, *Meteorologiya i Gidrologiya*, No. 5, 1960, pp. 3-10)

A Method for the Solution of a System of Equations for Short-Range Weather Prediction

A 4-page article in Vol. 132, No. 2, of the Doklady of the Academy of Sciences of the USSR is devoted to a method for the solution of

a full system of equations for the short-range prediction of weather. The author is I. A. Kibel', Corresponding Member of the Academy of Sciences of the USSR, an associate of the Institute of Applied Geophysics. ("Finite Differences Method for the Solution of a Full System of Equations for the Short-Range Prediction of Weather and Quasi-Geostrophic Ratios," by I. A. Kibel', Doklady of the Academy of Sciences of the USSR, Vol. 132, No. 2, 1960, pp. 319-322)

Latest Report on the Weather Ship "A. I. Voyeykov"

The following is a summary of a feature story appearing in the Soviet periodical Znaniye-Sila:

Two special weather ships were built in 1959 for the making of all-around meteorological observations at sea.

The first Soviet weather ship -- the "A. I. Voyeykov," is supplied with apparatus for sending radiosondes and meteorological rockets to great heights. In the autumn of last year it made its first voyage along the route Odessa-Singapore-Vladivostok.

In the Red Sea the temperature of the water is about 22 degrees even at a depth of two kilometers, that is, 18 to 20 degrees higher than at these same latitudes and at this same depth in the Atlantic and Indian oceans. This, the world's greatest accumulator of heat, was of interest to scientists even in the last century. However, it was not then possible to get precise data about the thermal balance of the Red Sea. Now, with modern apparatus available, the meteorologists on board have made measurements of temperature, humidity, and wind velocity from the surface of the sea to the very peak of the mast; at the same time they have measured the incoming and outgoing radiation. These observations, made on the first voyage of the "A. I. Voyeykov," made it possible to determine how much heat comes from the Sun, how much is expended in the evaporation of water from the surface of the sea and how much heat is lost due to scattering. It has become clear that an overwhelming part of the Sun's heat is expended in evaporating the water of the Red Sea -- to the extent of 17 mm per day. Expressed differently, if there were no inflow of water, evaporation would dry up the Red Sea in 300 years!

There was a brisk and favorable wind in the Gulf of Aden. The ship had entered into the Arabian branch of the Indian monsoon. During the time of the summer Indian monsoon strong southwesterly winds prevail in the vicinity of Socotra Island and on the Somalia coast. These winds, driving the surface waters from these coasts, cause an upwelling of cold water from the depths, thereby forming the Somalia cold current.

On entering the zone of the Somalia Current it became noticeably colder and the air became completely clear; even the clouds of the uppermost levels disappeared -- those usually observed at a height of 10 to 12 km. The question arises: is it possible that the influence of the Somalia Current extends to such heights? In order to answer this

important meteorological problem it will be necessary to visit the area repeatedly.

Throughout the year there is a zone of low atmospheric pressure over the equator; this extends upward to the stratosphere and even to the ionosphere. The stability of this zone and its territorial constancy have remained unexplained up to the present time. There is still no answer to another problem: is the equatorial zone a favorable one for stable ascending currents, that is, for the development of a cloud cover in depth? If it is, how can we explain the arid conditions on equatorial islands situated in the midst of the oceans here? And how can we explain a number of other phenomena observed at the equator which are nonconforming with theories of the general circulation of the atmosphere that have gained credence?

Weather ships can accomplish more than research work alone. Far from the shores of the Motherland, equipped with radar, telemetric and other modern technical devices, they will send out information and warnings, thereby safeguarding life from the onslaughts of raging catastrophes. They can supply information to ships at sea about the tracks of cyclones, typhoons and storms, thereby fulfilling the role of "weather bureaus afloat." ("Weather Ships," by R. Usmanov, Znaniiye-Sila, No. 5, 1960, p. 42)

#### IV. SEISMOLOGY

##### Conference on Seismology Held in Rumanian People's Republic

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"The Academy of Sciences of the Rumanian People's Republic has sponsored in Bucharest the First International Conference on the Study of Seismicity in the Carpathians and Balkans. Taking part in the conference, besides Rumanian scientists, were representatives from Bulgaria, Hungary, Poland, the USSR and Czechoslovakia. In their reports the Rumanian scientists G. Petrescu, I. Curcea, and others, described cases of individual earthquakes and presented the results of research on the development of a method for determining the epicenters and foci of earthquakes. They also exhibited a map of the seismic regionalization of Rumania. The Soviet scientists Ye. A. Kuzidalin, S. I. Masarskiy, I. A. Nersesov and D. A. Kharina spoke on their many years of experience in studying local low-intensity earthquakes in the Soviet Union. This experience can be used in the investigation of earthquakes occurring in the Carpathians and Balkans. A resolution adopted by the conference expresses the need for the development of a unified seismic scale for the determination of the intensity of earthquakes and the working out of a common method for making and generalizing microseismic observations. The compilation of seismic maps on the basis of common scientific criteria is of great importance." (Brief untitled and unsigned article in Nauka i Zhizn', No. 4, 1960, p. 80)

V. ARCTIC AND ANTARCTIC

Diurnal Variation in the Intensity of Cosmic Rays at Tikhaya Bay

A collection of articles pertaining to the high latitudes was published in 1959 by the Arctic and Antarctic Scientific Research Institute of the Main Administration of the Northern Sea Route. The title of this publication was "Problems of the Arctic and Antarctic." One of the articles, abstracted below, is entitled "Diurnal Variations in the Intensity of Cosmic Rays at Tikhaya Bay."

Diurnal variations in the intensity of the meson component of cosmic rays constitute an important group among the variations in intensity of cosmic rays of extraterrestrial origin. A detailed study of such variations can reveal the nature and basic properties of the solar corpuscular streams that cause many geophysical phenomena. However, temperature variations in the free atmosphere, also having diurnal variability, substantially distort the initial variations. Consequently, states the author, it is important to correctly evaluate the influence of temperature on these diurnal variations.

Taking into consideration the great variability of meteorological factors in the high latitudes it seemed useful, continues the author, to measure the variations of the initial intensity of the cosmic rays from the influence of atmospheric effects. This was done, based on data collected at the observatory at Tikhaya Bay. This station is situated at 80°19' N, 52°48' E, geomagnetic latitude 71°30'. An automatic ASK-2 ionization chamber at that station was in constant operation from December 1952 through September 1955.

The principal result of this work, forming the basis for this 8-page article, was the derivation of the diurnal variations in the intensity of cosmic rays during the warm and cold seasons, based on the recording of the meson component at Tikhaya Bay during the period indicated above. The results show that these diurnal variations in the initial intensity of cosmic rays do not have a seasonal march, that is, for both seasons the amplitude and phase of the diurnal wave are identical after correction for temperature.

The results of this research, in which several different methods were used for the processing of the data, confirm and partially supplement earlier derived conclusions drawn in respect to the character of the diurnal variations in the intensity of cosmic rays in the high latitudes. In this work radiation errors of the radiosonde were not taken into account; after these have been eliminated it is possible that there may be small modifications in the results. ("Diurnal Variations in the Intensity of Cosmic Rays at Tikhaya Bay," by I. O. Konstantinov, in the book "Problems of the Arctic and Antarctic," Leningrad, 1959, pp. 41-48)

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