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# Work done according to IGY Programme

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In the past period the research work undertaken according to the programme of the International Geophysical Year has yielded its first results.

New and important data have been obtained by the workers of the Research Institute of Earth's Magnetism, Ionosphere and Radio Propagation of the USSR Ministry of Communications, the Radio Engineering and Electronics Institute of the USSR Academy of Sciences and other research bodies.

In the main, lately a study has been made of the structure of the ionosphere, *i.e.*, the region of the atmosphere on which short-wave radio communication depends. It was known that electron concentration in the ionosphere increased gradually as the altitude increased and reached its maximum at a height of 300–400 km. But what happened beyond this maximum was unknown. To investigate the ionosphere above this maximum or, what is called the outer ionosphere, Dr. Y. Alpert suggested employing radio signals sent by the earth's first artificial satellite at the moments when the signals appear and disappear during the sputnik's flight over points of observation analogous to the appearance and disappearance of its visibility. As is known the first sputnik radiated signals at a frequency of 40 megacycles (wave length approximately 7·2 metres). When signals in this wave drop vertically they are not reflected by the ionosphere, but pass through it with insignificant absorption. If the angle of the wave drop is increased there is a time when the wave, deflected in the ionosphere, does not reach the point of observation but passes over it. As the sputnik approaches the observation point it becomes possible to record the appearance of signals and as it recedes, their disappearance.

The calculations made by the large electronic computing machine and an analysis of the moments of appearance and disappearance of the signals have provided data on the density of electron concentration above the maximum, layer $F_2$ of the ionosphere.

As a result, the distribution of electron concentration to an altitude of 600–700 km was obtained, and by means of extrapolation conclusions were drawn as to the "border" of the atmosphere which is, in all probability, at an altitude of 2000–3000 km where it contacts interplanetary gas. The results of the work were confirmed when high-altitude rockets were launched and also by moon-reflected signals.

Y. Kopylov, one of the researchers, has made a study of the data on measurement of the neutron component of cosmic rays with the help of a neutron monitor. His conclusions have confirmed that the intensity of the neutron component is to a considerable degree connected with magnetic perturbations and solar activity. Perhaps these conclusions will be supplemented and it will be possible to apply the changes in the intensity of the neutron component for more accurate prognostication of magnetic storms and radio communication.

The International Geophysical Year offers science unlimited possibilities. An abundant

exchange of material between scientists in all countries on solar activity, the ionosphere and the condition of the earth's magnetic field makes it possible greatly to enhance the accuracy of short-range magnetic and ionospheric prognostication. According to preliminary data accuracy of late has been increased by 20 per cent.

The establishment and inauguration of a magnetoionospheric station at the pole of homogeneous magnetisation may be considered a great achievement of Soviet science. This station is the Vostok in the Antarctic. It is situated at Lat. 78·5° S and Long. 111°E at an altitude of over 3800 metres above sea level, nearly 1500 km from the coast line. The small group of researchers here are making observations according to the programme of the International Geophysical Year.

Extensive and most valuable work is being done by an expedition on board the *Zarya*, a non-magnetic research vessel.

The *Zarya* is the only vessel in the world that contains no iron parts. It has bronze anchors and chains, brass hand rails and bronze anchor windlass. All the rigging is also made of non-magnetic materials. This eliminates the possibility of error being caused by the ship's iron when measuring the earth's magnetic field in the ocean.

A knowledge of the direction of the earth's magnetic field is absolutely necessary. For, ships sail the seas and aircraft fly in the skies according to the magnetic compass. Magnetic surveys were first begun in the ocean back in 1905. Then from 1909 to 1929 they were made by the *Carnegie*, a non-magnetic vessel that sank in 1929 due to a gasoline explosion. Determination of the earth's magnetic field was not undertaken again until 1952, when the Soviet Union built a new non-magnetic vessel equipped with the latest type of navigation instruments and unique apparatus for measurement of the earth's magnetic field.

According to the programme of the International Geophysical Year it is planned that the *Zarya* will make magnetic surveys in the Atlantic and Indian Oceans and in the western section of the Pacific. While on cruise, the *Zarya* is to visit magnetic observatories to compare instrument readings.

The *Zarya* left Leningrad early in August 1957 and by 1 May 1958, had covered 25,000 nautical miles: it crossed the Atlantic Ocean six times and in the course of its work discovered a number of formerly unknown magnetic anomalies. Consequently, the magnetic survey conducted by the researchers on board the *Zarya* facilitates determination and revision of the chart of the earth's magnetic field on the oceans. The *Zarya* still has 25,000 miles to cover. She has already visited observatories in Denmark, Britain, Puerto Rico, Spain, Brazil and in the Azors where instrument readings were compared. In the near future it will visit the Indian Magnetic Observatory at Alibag near Bombay.

Investigations according to the programme of the International Geophysical Year are in full swing and researchers will undoubtedly make many new discoveries.