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Abstract

Full Text

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GEOPHYSICS

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**SOME RESULTS OF MEASUREMENTS OF
TELLURIC CURRENTS AT THE NORTH
POLE-10 STATION IN 1963**

(Presented by Academician E. K. Fedorov on 7 VIII 1964)

The study of natural electric (telluric) currents in the Arctic Ocean, undertaken by the Institute of Terrestrial Magnetism, Ionosphere, and Radio-Wave Propagation of the Academy of Sciences of the USSR in 1962 (¹), was continued in 1963 at the North Pole-10 station (SP-10). Registration of telluric currents was begun on 1 VI and completed on 6 XI. During this time SP-10 drifted in the region $\varphi = 81^{\circ}50' - 84^{\circ}40'$ N and $\lambda = 140^{\circ}45' - 151^{\circ}26'$ E. The ocean depths were 1120-4006 m.

This article reports results concerning the constant component of the horizontal telluric currents and variations of vertical currents.

Measurements of the horizontal components of telluric currents were made on two lines arranged in the shape of the letter Γ . At the beginning of the measurements one of the lines was oriented along the magnetic meridian; the other line was perpendicular to the first. During the drift the orientation of the lines relative to the magnetic meridian was somewhat disturbed because of changes in magnetic declination and rotational motions of the ice floe. All these changes were taken into account in the course of the work.

The length of the lines was 120 m for S-N and 153 m for E-W. The measuring electrodes were placed in holes with a diameter of $\sim 1-2$ m. The immersion depth of the electrodes was 7 m. The holes were kept unfrozen throughout the work. The electrodes used were low-resistance silver-chloride nonpolarizing electrodes of the IELAN-IZMIRAN system. The intrinsic emf of the electrodes was systematically determined by transferring the terminal electrodes in vessels with seawater to the central (corner) hole. The drift of the electrodes' intrinsic emf was 0.19 mV per day for the E-W line and 0.13 mV per day for the S-N line. This procedure made it possible to carry out absolute measurements of the horizontal components of telluric currents. Electron-tube potentiometers of the PS-1-01 type were used as recording instruments. The sensitivity of the

Fig. 1

Figure 1: Fig. 1

recording was on average about 1 mV/km. The results of the work indicate that the constant component of the horizontal components of telluric currents in the region of the SP-10 station is absent.

In addition to absolute measurements of the horizontal components of telluric currents, observations were made of variations of vertical currents. The constant component of the vertical currents was not measured because there was no reliable method for allowing for the intrinsic emf of electrodes situated, during registration, at different ocean depths under different physicochemical conditions. An EPO-5 oscillograph was used as the recording instrument. On one tape the readings from two vertical lines with a base of 100 m were recorded, placed at different depths, for example: the first 0-100 m, the second 100-200 m; the first 100-200 m, the second 200-300 m, and so on down to a depth of 600 m. On a 100-meter base of vertical lines it was possible to isolate without distortion variations with frequencies below 7 Hz and amplitudes above 5 μ V. Nonpolarizing electrodes were used as electrodes.

silver chloride electrodes. At first, lead electrodes were also used, but because of changes in resistance and, in part, because of the instability of the lead electrodes' own e.m.f., it was necessary to abandon them completely. The electrodes were connected to a thin 2-mm wire in chlorovinyl insulation of the PVR brand. Great attention was paid to maintaining the verticality of the lines. For this purpose, lead weights in the form of cylinders weighing several kilograms were attached to the end of the measuring base. In the course of the work, the velocities of currents and of ice drift were taken into account. Theoretical calculations and the observations themselves showed that the projections of the vertical bases of the measuring lines onto the horizontal plane did not exceed the linear dimensions of the electrodes (~ 5 cm), while the relative error of the measurements was then considerably less than 1%.

Fig. 1

Fifty-five recording sessions were made on the EPO-5 of variations in vertical currents. The average duration of a record was 10 min. Such records were made during the most varied types of electromagnetic disturbances and necessarily during storms, when the amplitudes of oscillations of the horizontal currents reached 150 mV/km. As a result of our investigations it was shown that variations of vertical electric currents are absent in the region of the measurements. Figure 1 shows a simultaneous record of the vertical and horizontal components of the electric field during a disturbance. The record of the vertical component has the form of a straight line.

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REFERENCES

1. V. V. Novysh, G. A. Fonarev, *Geomagnetism and Aeronomy*, **3**, No. 6 (1963).

Note: Figure translations are in progress. See original paper for figures.

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