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INVESTIGATION OF TYPE-Pi2 GEOMAGNETIC PULSATIONS AT MAGNETOCONJUGATE POINTS

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SUMMARY

Analysis of the behavior of Pi2-pulsations at Sogra and Kerguelen shows that it is similar at both conjugate points. This speaks in favor of the generation mechanism of Pi2-pulsations proposed in 1967 by Raspopov [4], who explained it by the resonance of Alfven waves on the night side of the magnetosphere, in the tube of force directly adjacent to the beginning of the neutral layer.

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1. A joint registration of geomagnetic field pulsations at magnetoconjugate points Sogra (58° N.lat., 122° E.long.) and Kerguelen (58° S.lat. 124° E.long.) began in September 1964 after a microvariation station was installed at Sogra. This station was of Leningrad University's Bryunelli system.

At Kerguelen the registration of pulsations was conducted by means of a fluxmeter-type device of Zel'ser's construction. Installed there in February 1966 was also a microvariation station of Leningrad University, which permitted to conduct additionally a session of simultaneous registration of pulsations on a device having identical parameters.

For the investigation of type-Pi2 pulsations two observation periods were chosen: from 18 October to 16 November 1965 and from 4 February to 15 March 1966, which allowed us to compare the material obtained at conjugate points on a diversified and identical apparatus.

2. For the two observation periods 176 cases of Pi2-pulsations were analyzed, of which the oscillation periods varied within the limits from 40 to 180 sec. A good agreement took place in an overwhelming number of cases between the shape of trains of Pi2 at Sogra and Kerguelen (Fig.1) In trains where superimpositions of smaller-period oscillations were absent, the accuracy in the coincidence of extreme values of oscillation amplitude and, consequently, of their period, may be estimated at 2 to 3 seconds, which coincides with the precision of time readings from magnetograms.

(*) ISSLEDOVANIYE GEOMAGNITNYKH PUL'SATSIY TIPA Pi2 V MAGNITPSOPRYAZHENNYKH TOCHKAKH.

For a more complex configuration of oscillations the precision drops to 5—10 seconds, which is explained by differences in the behavior at conjugate points of pulsations constituting the type-Pi2 misrostructure.

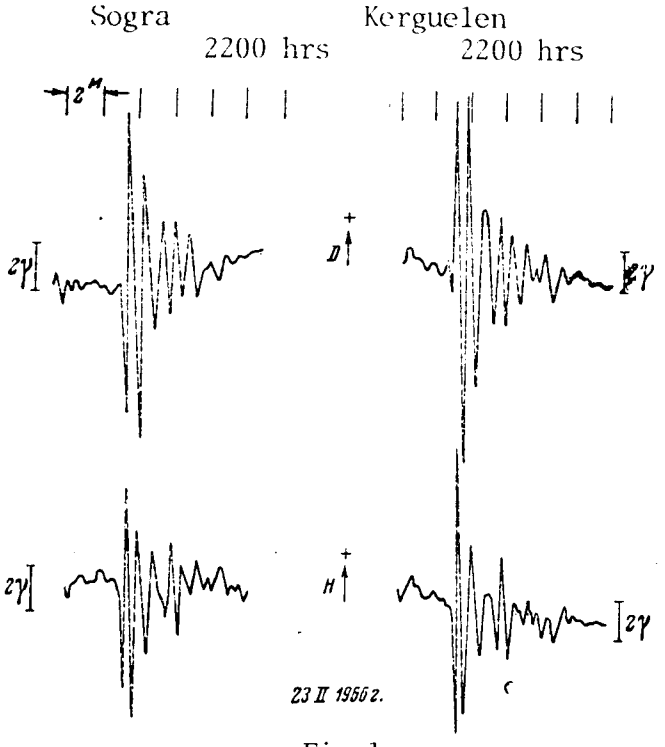

Fig.1

During the second period of observations the mean amplitude ratio $\alpha = A_S / A_K$ of Pi2-pulsations was found to equal to 1.0 for both horizontal components of the geomagnetic field. During

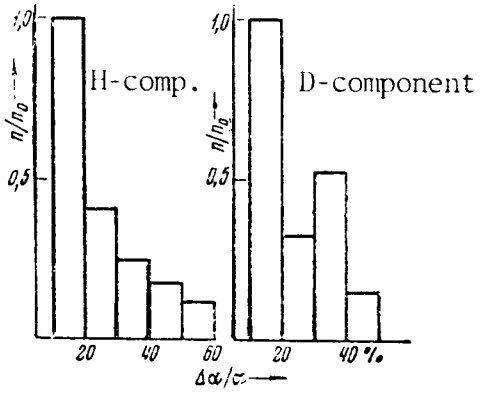

Fig.2

the first observation period only the amplitude ratio in the H-component was found to be equal to the unity; it was 0.9 for the D-component. The root-mean square values of the deviations $\Delta\alpha/\alpha$ from average values for both components did not exceed 10 percent in 1964 and 1966.

The character of the scattering of the quantity $\Delta\alpha/\alpha$ for the second observation period is represented in Fig.2. As may be seen, the mean amplitude ratio of the D-component in 1964 depart from the unity by a quantity also lying within the bounds of errors in the final results. It is possible that the noticed phenomenon is the result of systematic errors during observations of pulsations by diversified apparatus at two stations. It is not excluded, however, that the prevalence of Pi2 amplitude in Kerguelen in October-November 1964 is the result of the seasonal course of this pulsation parameter.

It should be remarked that in a series of cases of Pi2-generation a substantial influence on the value of the amplitude ratio of separate components at conjugate points was exerted by the variation in the polarization direction of oscillations in Sobra and Kerguelen.

Analysis of polarization of Pi2-oscillations has shown that the sign of oscillations of the H-component at magnetoconjugate points is identical. The sign of the D-component is different in the northern and southern hemispheres.

In view of significant differences in the frequency characteristics of the apparatus utilized during the first period of observations, the rotation direction of the magnetic field vector was determined only from magnetograms obtained in 1966.

102 Pi2 trains were examined. In 27 cases the rotation direction could not be reliably determined because of the complex character of oscillations or in view of their linear polarization. The rotation directions of the magnetic field vector at conjugate points were found to be opposite in 72 cases. For 3 trains the rotation directions of the vector coincided in both hemispheres. All cases of Pi2 with anomalous character of vector rotation were registered on 11 February 1966 from 0025 to 0150 hours. For these trains substantial differences were noted in the amplitude of oscillations at conjugate points: the Pi2's amplitude at Kerguelen was about 1.7 times higher than at Sogra.

3. From the analysis of the behavior of Pi2-pulsations at Sogra and Kerguelen the conclusion may be derived that the behavior of pulsations of this type is similar at both conjugate points. They are synchronously excited in the norther and southern hemispheres, and their shape, period and amplitude are in good agreement. The sign coincidence of H-components is opposite in both hemispheres. The rotation direction of the magnetic field vector is characteristic of the excitation in the magnetosphere of even harmonics of standing Alfvén waves.

Similar behavior of Pi2-pulsations at magnetoconjugate points speaks in favor of the generation mechanism of Pi2-pulsations proposed in ref. [4]. According to the latter, the generation of Pi2 is explained by the resonance of Alfvén waves on the night side of the magnetosphere, in the tube of force directly adjacent to the beginning of the neutral layer. Owing to the closeness of the neutral layer an Alfvén velocity minimum takes place in the equatorial plane, which leads to the subdivision of the magnetosphere in two symmetrical parts. That is why the character of pulsations' polarization at conjugate points will correspond to the behavior of the second harmonic of Alfvén waves, while the periods and amplitudes of oscillations must about mutually coincide.

***** THE END *****

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