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North–south asymmetry of geomagnetic and tropospheric events

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Abstract—The influences of the solar plasma on geomagnetic and atmospheric phenomena are considered. There are the north–south asymmetry in the reaction of the geomagnetic field, of the geopotential and of the pressure in the magnetically conjugate points relative to the direction of the interplanetary magnetic field. There are the synchronism between direction of the meridional component of wind at the level of the tropopause and the direction of the interplanetary magnetic field.

1. Introduction

At present there are no doubts that, owing to solar wind effect on the Earth, a magnetospheric convection is developing in polar regions in the form of twin-vortex pattern for each hemisphere; the motion in vortices is of opposite directions. Reliable proofs have been obtained confirming the existence of close correlation between the magnetospheric convection and the interplanetary magnetic field. The results of investigations in this field for the last 3–4 years were nicely described in works by Nishida and Obayashi (1972) and Heppner (1972).

Diurnal variations of the geomagnetic field in polar regions are principally caused by ionospheric Hall currents resulting from the magnetospheric convection. Therefore, by investigating magnetic field variations near the Earth's surface, one may judge about the character of the magnetospheric convection and its variations as well as get definite information on the interplanetary magnetic field (Wilcox, 1972).

The similarity of some regularities between the behaviour of magnetic-field variation in high latitudes and the behaviour of some parameters of the lower atmosphere allows us to suppose that they are conditioned by a common cause, i.e. by magnetospheric convection. As an example may serve the north–south asymmetry in geomagnetic field variation which has a very good correlation with the change of polarity of interplanetary magnetic field sectors, as well as the north–south asymmetry in atmosphere pressure distribution in the near Earth layer, according to the data of magnetoconjugate stations which, with the Earth's rotation, happen to be under cusps in the day side of the magnetosphere where the most intensive zonal magnetosphere convection is observed.

2. Experimental Results and Remarks

2.1 *Geomagnetic field*

In Fig. 1 (Mansurov and Mansurova, 1973) mean values of the vertical component Z, corrected for secular variation, are shown for nearpole stations of the southern (in the top) and northern (in the bottom) hemispheres, calculated separately