SEMIANNUAL AND UT VARIATION OF GEOMAGNETIC ACTIVITY AS HISTORY OF SOLAR-TERRESTRIAL PHYSICS

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There are the classical semiannual variation of geomagnetic activity (GA), first recognized by Sabine (1856) and the Universal Time (UT) variation found by McIntosh (1959). Explanation of the semiannual and UT variation of (GA) presents history of development of the solar-terrestrial physics and is a good test for any modern model of interaction taking into account mutual directions of the solar wind velocity (V), interplanetary magnetic field (IMF) and geomagnetic moment (M). It should be noted that the semiannual and UT variation of GA has not explanation in terms of existing mechanisms for now. In particular, the explanation for the dipole tilt modulation of observed activity is still obscure. Axial hypothesis (Bartels, 1932) must be discarded because of its discordance with observations (Swalgaard, 1977). However, influence of the dipole tilt on GA has theoretical ground in terms of quasi-viscous interaction and Kelvin-Helmholtz instability (Boller and Stolov, 1970). Russell and McPherron (RM), 1973 suggested that the solar magnetic fields lying in the solar equatorial plane have maxima of southward Bz component in the GSM c. s. near maxima of GA. Reconnection as a physical paradigm, as applied to the phenomena of solar-terrestrial physics, and the “RM” mechanism are criticized simultaneously at present (Akasofu, 1998). The UT variations for different mechanisms must be taken into account as they help discriminate between mechanisms: the “axial” mechanism has no UT variation, the "RM"mechanism has the wrong UT variation, and so on. All magnetic indices show clear semiannual variations near equinoxes and distorted UT variation due to uneven station distribution. We present all history of the problem. At last based on our results we suggest a possible explanation of semiannual and UT variation of GA (Kuznetsova et al, 2006). Phase of statistical semiannual variation in our study is determined by semiannual variation of value of the geomagnetic moment component My at the plane perpendicular to the Sun-Earth line: maximal values at equinoxes and minimal ones at solstices. Amplitude is determined by the solar wind electric field component Ez perpendicular to the ecliptic plane. The observed UT variation of am index is well explained in terms of our approach too.

geomagnetism, solar-terrestrial physics, semiannual and UT variation of geomagnetic activity

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