



Geomagnetic Jerks, Their Repeatability and Constraints Put on the Estimations of Deep Mantle Conductivity

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The main goal of carried investigations was revealing the possible cause-and-effect relation between the core originated geomagnetic decade variations, geomagnetic jerks and global helio-geophysical phenomena. The revealed series of global geomagnetic jerks, occurred during the 20th century permits to conclude that the pattern, conceived of spatio-temporal superposition of stochastically appearing on the Earth's surface jerks, fits well the spectrum of geomagnetic decade variations originated in the Earth's liquid core. Hence impulses in the Earth's daily rotation variations (LOD), geographic pole wandering and in the rates of their variations as well as solar activity Wolf number yearly mean values series were studied for the period of 20th century. Global geomagnetic field variations were studied also by integral geomagnetic characteristics as variations of dip pole wandering rates and geomagnetic dipole decade rates. Comparison of years of revealed impulsive changes in the helio-geophysical parameters with the epochs of global jerks shows that although in some cases they co-temporize, it is difficult to reveal their full correspondence or even certain delay, which would make reasonable assumption that there is cause-and-effect relation between them. Some of jerks co-temporize with the impulsive changes revealed in series of variations, and some with impulses in the series of variation rates. Better agreement was not reached while was analysed also the jerks intensity. On the basis of complex analysis of variations of global geomagnetic and helio-geophysical characteristics, and the jerks it might be made only a conclusion that jerks are sensitive indicators, depicting all the changes in the force balance in planetary scale, which have their manifestation on the variations of global geomagnetic characteristics and in the solar and geomagnetic activity. Lack of strong coincidence or persistent delay between geomagnetic and LOD variations in the high-frequency spectrum range, absence of global westward drift in manifestation of delay of liquid core as a whole, with respect to the rigid mantle evidence the weakness of electromagnetic coupling of the Earth's liquid core with its rigid mantle. Besides, fact of appearance on the Earth's surface rapid jerks itself, is an important evidence of lower values of electrical conductivity of lower mantle, upper limit of which may be of order of 100 Sm/m, which is in three order less the electrical conductivity of core liquid. Thus in result of complex analysis it is reasonable to conclude on weak character of electromagnetic forces in core-mantle coupling during the recent 100-year time period under investigation.

The problem of some correspondence of quasi-decade repeatability of jerks on the globe, with the cycle of solar activity remains unsolved yet. A single hypothesis, which could explain this, may be manifestation of phenomenon of stochastic resonance, taking place in result of influence of weak periodic signal of external variations on the stochastic character jerks of internal origins. Quantitative evidences for this hypothesis need further studies of the problem.