Geophysical Research Abstracts
Vol. 16, EGU2014-16228, 2014
EGU General Assembly 2014

Rethinking the problem of ionosphere-lithosphere coupling

Yuri Ruzhin (2) and Victor Novikov (1)

(1) Joint Institute for High Temperatures of Russian Academy of Sciences, Laboratory of Pulsed MHD Power Systems for Geophysics, Moscow, Russian Federation (novikov@ihed.ras.ru, +7-495-484-1947), (2) Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radio Waves Propagation (IZMIRAN) of Russian Academy of Sciences, Moscow, Russia Federation (ruzhin@izmiran.ru)

An overview of research of possible relations between variations of geomagnetic field and seismicity is presented, including Sq-variations and geomagnetic storms. There are many papers demonstrating positive correlations between geomagnetic field variations and subsequent earthquake occurrence that allows to authors to talk about earthquake triggering impact provided by ionospheric processes on lithosphere. Nevertheless, there is another opinion on negligible impact of geomagnetic disturbances on the earthquake source supported by statistical analysis of correlation between variations of geomagnetic field and global and regional seismicity. Mainly, the both points of view on this problem are based on statistical research without detailed consideration of possible physical mechanisms which may be involved into the supposed earthquake triggering, or very rough estimations of possible increase of stresses in the faults under critical (near to failure) state were made. Recently it was shown that the fluids may play very important role in the electromagnetic earthquake triggering, and the secondary triggering mechanism should be considered when the fluid migrating into the fault under electromagnetic action may provide fault weakening up to earthquake triggering threshold. At the same time, depending on fault orientation, local hydrological structure of the crust around the fault, location of fluid reservoirs, etc. it may be possible that fluid migration from the fault may provide the fault strengthening, and in this case the impact of variation of geomagnetic field may provide an opposite effect. In so doing, it is useless to apply only statistical approach for the problem of ionosphere-lithosphere coupling, and in each case the possible behavior of fluids should be considered under electromagnetic impact on lithosphere. Experimental results supporting this idea and obtained at the spring-block model simulating the seismic cycle (slow accumulation and sharp drop of stresses in the fault gauge), as well as field observations of water level variations in the well during ionospheric disturbances are presented and discussed.