

Model for solar flare influence to the seismic activity

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Impulse impact of the MHD-generator electric current to the lithosphere results in tectonic energy release accumulated in the ground during earthquake preparing. This process is accompanied with occurrence of the relatively weak earthquakes. Investigation of the heating flow generation in the ground during magnetic storm with sudden commencement shows that the heating energy of magnetic storm current commensurable with the energy released by earthquakes. The main part of heat is released in the upper level of fault with the depth of 10 – 20 km and it is concentrated along the boundaries of fault. It was carried out the researches which show the connection between seismic activity and solar flares. Below we propose the possible mechanism of the solar flares influence to the seismic activity.

Solar flare is accompanied with the impulse flow of ionized radiation. The absorption of solar flare X-ray in the lower ionosphere results in additional ionization of one. Variation of ionization value leads to the impulse growth of conductivity in the sunlit ionosphere. It is shown in the work that impulse variation of conductivity results in generation of magnetic field oscillation in the Earth – ionosphere layer. The equation for magnetic field components in the layer has been derived. Calculation show that spasmodic variation of the ionosphere conductivity by solar flare leads to appearance of the damped oscillation of magnetic field on the Earth's surface. Period and damping time of oscillations depend on the latitude and longitude of observation point. Characteristics of oscillation are defined by the altitude of X-ray absorption. This altitude depends on the hardness of solar flare ionizing radiation. Calculations show that the period of oscillation is reduced with the latitude. Attenuation coefficient has minimum value in the middle latitudes. Period of magnetic field oscillations is of the order of (1 – 10) s. The amplitude – temporal characteristics of oscillation are defined by perturbation of the ionosphere conductivity. Magnetic field disturbances in the Earth – ionosphere layer has oscillating or aperiodic character depends on ratio between surges of the Hall and Pedersen ionosphere conductivity. The amplitude of magnetic field oscillations can reaches (10 – 100) nT due to strong surges of the ionosphere conductivity.

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Calculation of electric current value in the lithosphere caused by magnetic field oscillations in the Earth-ionosphere layer has been carried out. The current density can reach a value up to 10^{-7} A/m² that is comparable with electric current density in the Earth crust generated by pulsed MHD power systems. So the heating energy released by this current can stimulate seismic activity. Finally, the set of processes can be as follows. The absorption of ionized radiation of solar flare is accompanied by impulse surges of the ionosphere conductivity and generation of magnetic field oscillations in the Earth – ionosphere layer. These oscillations induce electric current in the lithosphere. Heating energy released by current impact to the lithosphere state during earthquake preparing.