On a possibility of seismic activity stimulation by ionizing radiation of solar flares

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A possible mechanism of earthquake triggering by ionizing radiation of solar flares is considered. A theoretical model and results of numerical calculations of disturbance of electric field, electric current, and heat release in lithosphere associated with variation of ionosphere conductivity caused by absorption of ionizing radiation of solar flares are presented. A generation of geomagnetic field disturbances in a range of seconds/tens of seconds is possible as a result of large-scale perturbation of a conductivity of the bottom part of ionosphere in horizontal direction in the presence of external electric field. Amplitude-time characteristics of the geomagnetic disturbance depend upon a perturbation of integral conductivity of ionosphere. Depending on relation between integral Hall and Pedersen conductivities of disturbed ionosphere the oscillating and aperiodic modes of magnetic disturbances may be observed. For strong perturbations of the ionosphere conductivities amplitude of pulsations may obtain $\sim 10^2$ nT. In this case the amplitude of horizontal component of electric field on the Earth surface obtains 0.01 mV/m, electric current density in lithosphere – 10^{-6} A/m^2, and the power density of heat release produced by the generated current is 10^{-7} W/m^3. It is shown that the absorption of ionizing radiation of solar flares can result in variations of a density of telluric currents in seismogenic faults comparable with a current density generated in the Earth crust by artificial pulsed power systems (geophysical MHD generator "Pamir-2"and electric pulsed facility "ERGU-600"), which provide regional earthquake triggering and spatiotemporal variation of seismic activity. Therefore, triggering of seismic events is possible by not only man-made pulsed power sources but by the solar flares as well. The obtained results may be a physical basis for a novel approach to solve the problem of short-term earthquake prediction based on electromagnetic triggering phenomena.

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