Impact of solar flares on the global seismic activity: A case study of solar flare X9.3 class on September 6, 2017

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The studies completed to-date on a relation of the Earth's seismicity and solar processes provide the fuzzy and contradictory results. For verification of an idea that solar flares can trigger earthquakes we have analyzed a case of powerful surge of solar flash activity early in September 2017 during approaching the minimum of 24th solar cycle was accompanied by significant disturbances of space weather. On September 6, 2017 a group of sun spots AR2673 generated a large solar flare of X9.3 class, the strongest flare over the past twelve years. Its explosion produced a coronal mass ejection partially directed towards the Earth. We carried out a statistical analysis of the USGS earthquake catalog for determination of effect of solar flares on global seismic activity. A new evidence of earthquake triggering due to the Sun-Earth interaction has been demonstrated by simple comparison of behavior of Earth's seismicity before and after the strong solar flare. The global number of earthquakes with magnitude of 4.1 to 8.2 (USGS catalog representativeness according to Gutenberg-Richter law) within 10 days after the solar flare has increased by 65%. One of the possible mechanisms of seismic activity activation may be a generation of sharp rise of telluric currents in the faults induced by ionospheric processes due to strong solar flare. The demonstrated possibility of electric/electromagnetic triggering of earthquake due to space weather disturbances is supported by results of field and laboratory studies, where the earthquakes (both natural and laboratory) were initiated by injection of electrical current into the Earth crust. For the specific case of artificial electric earthquake triggering the current density at the depth of earthquake sources is comparable with estimations of a density of telluric currents induced by variation of space weather conditions due to solar flares.

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