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Influence of Solar X-ray flares on the electric field and VLF waves.

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One of the factors affecting the upper atmosphere is solar flares. The flares may cause additional ionization of the ionospheric D layer and below (where degree of ionization is low). The feature of the flares is in the rate of the increase in emission flow – it takes a few minutes or even less to increase in 1-2 orders. Ionization increase appeared due to the effects is detected by measurements on the Earth surface. The ionized area appeared and conductivity growth leads to specific variations in VLF waves and atmospheric electric parameters.
Our data obtained from Mikhnevo observatory located in Moscow region were used. The observatory provides continuous data of the electrical field and current and signal records from several VLF stations since 2011. Using the data collected as well as GOES X-ray flux data it has been shown that solar flares may cause changes in phases and amplitudes of VLF waves and oscillation of the Earth's electric filed and current near the surface. Additionally the data were used to verify models of VLF penetration through the atmosphere. Further investigations may lead to more accurate models of VLF waves propagation and even better understanding of D layer structure.