

Earth's Lower Ionosphere under energetic events: solar flares and gamma ray bursts as drivers for VLF signal perturbations

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Earth's lower ionospheric perturbations induced by different phenomena, such as energetic solar flare events of high class on one hand and gamma ray bursts on the other, were examined through a remote sensing approach by utilization of VLF radio signals (Very Low Frequency, 3-30 kHz) propagating globally within Earth-ionosphere waveguide. Solar X-ray radiation data were taken from Geostationary Operational Environmental Satellites (GOES) database, while data related to gamma ray bursts were taken from Swift satellite database. VLF data used in this research are from Belgrade database, obtained from receiver system located at the Institute of Physics in Belgrade, Serbia, cover period of several consecutive years during solar cycle 24. Based on VLF registrations from European transmitters, temporal evolution and general patterns in VLF signal perturbations related to these events were examined, with main results related to D-region plasma behavior under such energetic events presented here.

Key words: X-ray flares, gamma ray bursts, ionosphere, VLF signal perturbation