Lower Ionosphere perturbations due to Solar X-ray flares simultaneously monitored on two VLF signals with close GCPs

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During Solar flare events, emitted energy from spectral range of X-rays plays the role of major source of additional ionization within atmospheric height range that corresponds to the sunlit lower Ionospheric heights (50-90 km). Thus triggered perturbations in subionospheric propagation of Very Low Frequency (VLF) radio signals, manifested as amplitude and phase delay deviations from their unperturbed values and from signal's regular behavior, reflect induced plasma perturbations due to incident Solar flare energy and are used for monitoring of the causative agent's characteristics and underlying coupling processes. Influence of relatively low to moderate intensity Solar flare events from second half of 23rd Solar cycle were analyzed, based on amplitude and phase delay perturbations of VLF signals transmitted from USA and UK and simultaneously monitored in Serbia and Hungary. Solar X-radiation data were taken from GOES satellites database. Numerical simulations were conducted by the use of Long Wave Propagation Capability (LWPC) software. Closely spatially positioned Great Circle Paths (GCPs) of VLF signals simultaneously observed at two receiver sites, enabled detailed comparative analysis regarding signals' behavior and extrema structure and redistribution along GCP during the influence of considered X-ray Solar flare events. Main results are presented in this paper.