

## VLF subionospheric disturbances and electrical properties of lightning discharges observed by JEM-GLIMS mission

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In this paper we report the preliminary results of ionospheric perturbation and causative lightning discharges observed by JEM-GLIMS mission to study the electromagnetic coupling mechanism between the tropospheric lightning and overlaying ionosphere. Continuous nadir optical observations of lightning discharges are performed by ISS JEM-GLIMS mission and many lightning images have been observed globally. Ionospheric perturbations and electrical properties of causative lightning discharges such as polarity and vertical charge moment changes are derived by the data from UEC's ground-based observation networks of VLF/LF transmitter signal reception and of ELF waveforms respectively. We discuss the electrical coupling efficiencies from the tropospheric lightning to the ionosphere by comparing the area of the lightning flash and corresponding subionospheric VLF disturbances and lightning properties.

Keywords: Transient Luminous Events, lightning discharges, GLIMS, ionospheric perturbation, charge moment