STUDY ON LITHOSPHERE-ATMOSPHERE-IONOSPHERE (LAIC) COUPLING BY USING SATELLITE-, GROUND-BASED MEASUREMENTS AND NUMERICAL MODELING

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In this talk research activity of my group related to the terrestrial electromagnetic environment will be introduced. This is an interdisciplinary research field consisting of electromagnetic phenomena in the lithosphere, atmosphere and ionosphere. The experimental (observational) and theoretical approaches are taken to understand physical mechanisms of the electromagnetic phenomena as well as coupling mechanisms between the different altitudes. Practical applications of electromagnetic measurements are also considered to monitor the earth environment and mitigate natural disasters such as earthquakes, severe local weather, global climate change and space weather. Both ground-based and spacecraft measurement data are used. Ground-based low frequency multi component measurements in the ULF/ELF/VLF rages are conducted by using our network observations over Japan, whilst observations by satellites in the low-altitude (such as French DEMETER) provide the wave and particle data. The perturbations in the D region of the ionosphere are continuously monitored by our VLF observations network. The natural ELF/ULF emissions are observed to monitor mainly the tropospheric phenomena. The ionospheric anomalies related to major seismic activities, global and local thunderstorm activities and space weather as well as tropospheric electrical phenomena such as lightning flashes, TLEs (red sprites and elves), TGF (Terrestrial Gamma Ray Flashes) are examples of our targets. The results from numerical calculations of above mentioned phenomena performed by using e.g. FDTD (Finite Difference Time Domain) method for the VLF transmitter wave propagations in the EIWG (Earth Ionosphere Wave Guide) are compared with those from our observations to produce the realistic physical models.