

# Global remote sensing of the atmospheric electromagnetic environment

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Extremely-low frequency electromagnetic waves are used to explore the atmospheric electromagnetic environment of the Earth. Three networks of magnetometers record the properties of natural electromagnetic fields on the global, regional, and on the local scale.

The global magnetometer network detects locations of lightning discharges around the globe and monitors the temporal and spatial evolution of particularly intense thunderstorms. Satellite based cloud cover recordings help to determine the effective charge density of thunderclouds and reveal the electrical nature of severe weather.

The regional magnetometer network detects mesospheric electrical breakdown between the troposphere and the ionosphere, optically imaged with an intensified video camera as a transient optical emission, denoted sprite.

These sprites are pictured as red and bluish phenomena above thunderstorms, which enlighten a substantial volume of the mesosphere.

The local magnetometer network is operated as an interferometer to measure the electromagnetic wave propagation speed, which

is determined by the mesospheric conductivity. This variable conductivity is controlled by solar short wave radiation and energetic particle precipitation into the atmosphere, and can be monitored from the diurnal to the decadal time scale.