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Monitoring the lower ionosphere with a small scale interferometric network of radio receivers

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Sprites, gigantic jets and relativistic electron beams above thunderclouds attracted significant attention in the last decades. These natural transient events are caused by lightning discharges and they are associated with characteristic low frequency radio emissions from a certain height above thunderclouds. The altitudes of these sources can be inferred from their radio waves which are reflected by the lower ionosphere along their propagation path. The ionospheric conditions vary with time and location which makes it important to monitor the lower ionosphere during the observation period.

This work uses 100 kHz radio emissions from the LOng Range Navigation (LORAN) transmitters in Western Europe to monitor the height of the reflecting lower ionosphere. The pulsed LORAN transmissions are synced with high precision to atomic time and they are therefore particularly suitable for monitoring the lower ionosphere. The vertical electric field strengths of the LORAN transmissions are recorded with a small scale interferometric network of eight wide band digital radio receivers which are separated by distances ranging from $\sim$3 km up to $\sim$30 km. The network was deployed in southern France during the summer months from July to September in 2011 and 2012 when numerous thunderstorms occur.

The ionospheric monitoring with the network reveals the dynamics of the lower ionosphere at different locations throughout the observation period. Results of the ionospheric monitoring for different meteorological conditions will be presented.