



## **Coupling of thunderstorms to the stratosphere, mesosphere and ionosphere**

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During the past 4 years, the Research Training Network “Coupling of Atmospheric Layers” (CAL) has studied effects of thunderstorms on the upper regions of the atmosphere. The network has conducted observations over Southern Europe of parameters related to electrical discharges in the mesosphere (sprites) and simulated aspects of the sprite discharge processes and their effects on the atmosphere and ionosphere. Observations point to significant energy deposition by sprites in the mesosphere observed as infra sound detected at up to 1000 km distance. The important role of intra-cloud (IC) lightning in sprite generation has been made clear by the first simultaneous observations of IC activity, sprite activity and electromagnetic radiation in the VLF range. Sprites, elves and lightning affect ionization and heating of the lower ionosphere/mesosphere as seen in signal characteristics in the VLF and HF range. Simulations of sprite ignition show generation of relativistic electrons that may be the source of Terrestrial Gamma-ray flashes and model estimates of sprite perturbations to the atmospheric electric circuit, greenhouse gas concentrations and atmospheric dynamics show significant local perturbations, but negligible global effects. The presentation will give an overview of the results and look towards the future for European sprite research with the TARANIS and ASIM missions planned for launch in 2011.