



“Early” type VLF perturbations observed in relation with sprites and elves during the EuroSprite campaigns

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In support of the summer *EuroSprite* campaigns in southern France, and in the framework of an EU-RTN (European Union research training network) project (e.g., <http://www.dsri.dk/cal/>), a new narrow band VLF receiver was installed in Crete, Greece (35.31⁰ N; 25.08⁰ E) and started its routine operation in July 18, 2003. The Crete VLF station was capable of monitoring several transmitters, some of them chosen in order to provide VLF links that traverse subionospheric regions in the proximity of the areas viewed for transient luminous event detection (sprites and elves) by the *EuroSprite* cameras. In this presentation we summarize the observational findings regarding the so called “early” VLF events of ionospheric perturbations which are found to occur in relation with sprites and elves. In particular, we focus on a new category of early type perturbations, which, contrary to the so called “early/fast” events whose onset duration is less than ~ 20 ms, are characterized by a gradual growth and thus a “slow” onset duration ranging from about 0.5 to 2.5 s. These long growths are indicative of a new physical process at work which, following a sprite-causative cloud-to-ground discharge, leads to a gradual ionization build up in the lower ionosphere which can be responsible for the long onset duration of the observed perturbations. We postulate that such long onset durations are due to secondary ionization build-up in the upper D region below the nighttime VLF reflection heights, caused mainly by the impact on sprite-produced electrons of sequential electromagnetic pulses radiated upwards from in-cloud discharges.