

TARANIS: a Microsatellite Project to Study Impulsive Energy Transfers from the Atmosphere to the Ionosphere and Magnetosphere

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Taranis (Tool for the Analysis of RAdiations from lightNIngs and Sprites) is a CNES microsatellite project in phase B. The main scientific objective is to compare observations of TLEs (Transient Luminous Events) with observations of terrestrial TGFs (Transient Gamma Flashes), electromagnetic and electrostatic emissions, and energetic electrons, in order to investigate physical mechanisms allowing impulsive transfers of energy between the neutral atmosphere and the ionospheric and magnetospheric plasmas. The science objectives include: characterization of TLEs (Transient Luminous Events including sprites, jets elves and halos) and TGFs (Terrestrial Gamma ray Flashes), global mapping and occurrence rates, relation of TLEs, TGFs, associated electromagnetic emissions and high energy electrons in order to determine the source mechanisms, determination of triggering factors and formation conditions, characterization of the parent lightning that cause TLEs and TGFs and precipitate electrons, investigation of Wave Plasma Interactions leading to precipitated (LEP) and accelerated (runaway) electrons, effects on the radiation belt of low altitude sources, tracking of the variability of the radiation belts from electron and wave measurements, effects on thermospheric parameters (ionisation rate, NO_x, O₃). Measurements on board the satellite will be associated with ground based observations. The scientific payload includes two imagers and three photometers with observation bandwidths in UV and IR, selected to differentiate lightning and TLEs by their different atmospheric absorption. It also includes an X and gamma ray detectors, electric and magnetic sensors and two high energy electron detectors. Simulations using theoretical work and experimental results are used to determine the specifications of the instrumentation.