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HALESIS projet: Hight Altitude Luminous Events Studied by Infrared Spectro-imagery

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During the last two decades, the discovery of transient luminous events (TLEs) in the high atmosphere [1], as well as the observation of gamma ray flashes of terrestrial origin (Terrestrial Gamma Flashes or TGF) [2] demonstrated the existence of another interaction processes between the different atmospheric layers (troposphere, stratosphere, mesosphere and ionosphere). Indeed, the frequency of occurrence of these phenomena over thunderstorm cells, and the energies involved provide evidence for an impulsive energy transfer between the troposphere and the highest atmospheric layers, which was not considered before.

HALESIS (High Altitude Luminous Events Studied by Infrared Spectro-imagery) is an innovative project based on hyperspectral imagery. The purpose of this experience is to measure the atmospheric perturbation in the minutes following the occurrence of Transient Luminous Events (TLEs) from a stratospheric balloon in the altitude range of 20 to 40 km. The first part of the study has been dedicated to establish the project feasibility. To do that, we have simulated spectral perturbation induced by an isolated blue jet. Theoretical predictions [3] have been used to simulate the radiative perturbation due to O_3, NO, NO_2, NO+ concentration induced by the blue jet. Simulations have been performed using the line by line radiative transfer model LBLRM [4] taking into account of the Non Local Thermodynamic Equilibrium hypotheses. Then, the expected signatures have been compared to the available instrumentation.

During this talk, HALESIS project and the results of the feasibility study will be presented. Then, the estimated spectral signatures will be confronted with the technical capabilities of different kind of hyperspectral imagers. We will conclude on the project feasibility, but also on the challenges that lie ahead for an imager perfectly suited for experiences like HALESIS.

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