Exploitation of optical measurements of the TARANIS satellite and operational monitoring

Background: Thunderstorms are present all over the world. They produce lightning that emits electromagnetic waves (optical and radio). Since the 1970s, flashes have been observed from space, but it is only since the mid-1990s that imagers on low-orbit satellites have made it possible to draw the first global maps of the electrical activity of thunderstorms. The new generation of geostationary meteorological satellites is equipped for the first time with a lightning detector (camera). The contribution of these instruments will be crucial for the real-time warning of severe weather events (torrential rains, flash floods, tornadoes ...). In addition, very brief and large optical phenomena, called sprites, were observed at great distances over thunderstorms from the 1990s. They are the result of the electrostatic coupling between the thundercloud, in which a lightning strike occurs, and the lower layers of the ionosphere. These events are common on a global scale. Thousands of sprites have already been observed. But despite more than 20 years of increasingly fine studies of these phenomena many aspects are still misunderstood and unknown. To do this, CNES's TARANIS (Tool for the Analysis of RAdiations from lightNing and Sprites) satellite will aim to measure impulse energy transfers between the troposphere and the highest layers of the atmosphere. The CEA is the principal investigator (PI) of the optical instrument on board the TARANIS satellite. This instrument, called MCP (MicroCameras and Photometers), is intended to observe lightning and Transient Luminous Events (TLE) that occur in the upper atmosphere. It consists of 2 cameras and 4 photometers operating in different wavelength ranges. These observations will complement the operational measurements of the geostationary satellites mentioned above. TARANIS will be launched in summer 2020.

Goals: The main objectives of the post-doctoral fellow will be:

1) **participate in the commissioning phase of the satellite**. This phase of the satellite's life will last 6 months from launch. The first 2 months will be dedicated to a functional validation of the entire payload. Over the next 4 months, efforts will be made to validate instrumental performance and adjust the instrument parameters, and more particularly those of its TLE and lightning detection algorithm. It will therefore be necessary to validate that the observations are indeed due to lightning and TLE. This will be done in coordination with simultaneous ground measurements made in France or Western Europe as part of the French Project SOLID (Space based Optical Lightning Detection) or in collaboration with European partners. The CEA is also involved in this ground measurement campaign.

2) **conduct case and statistical studies** on lightning and TLE from high-resolution (burst mode) or low-resolution (survey mode all along each orbit) data. New optical diagnostics for TLE and lightning, developed at this moment by two PhD students supervised by the CEA and university partners, will be used.

3) **participate in the daily monitoring** of the operational functioning of the optical instrument, in direct connection with the principal investigator at the CEA and in monitoring the evolution of instrumental **performance** during the mission in cooperation with the PI and the experts of the instrument's technical expertise center based at CNES.

These analyses will be done within the framework of the scientific community working on atmospheric and space electricity in France, but also around the world (collaboration with American and Japanese laboratories).

The postdoctoral work has a duration of one year (once renewable). It will take place at the CEA's DIF center in Bruyères le Châtel (30 km south of Paris). The post-doctoral fellowship can begin as early as Fall 2020.

To apply, please submit a resume, cover letter and summary of your PhD thesis to:

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