PHD POSITION IN ATMOSPHERIC PHYSICAL CHEMISTRY

The laboratory for Atmophere, Environment, and Space Observation (LATMOS, Laboratoire Atmosphères, Milieux, Observations Spatiales) and The French Aerospace Lab (ONERA) seeks applicants for a phd position in atmospheric Physical Chemistry.

SUBJECT

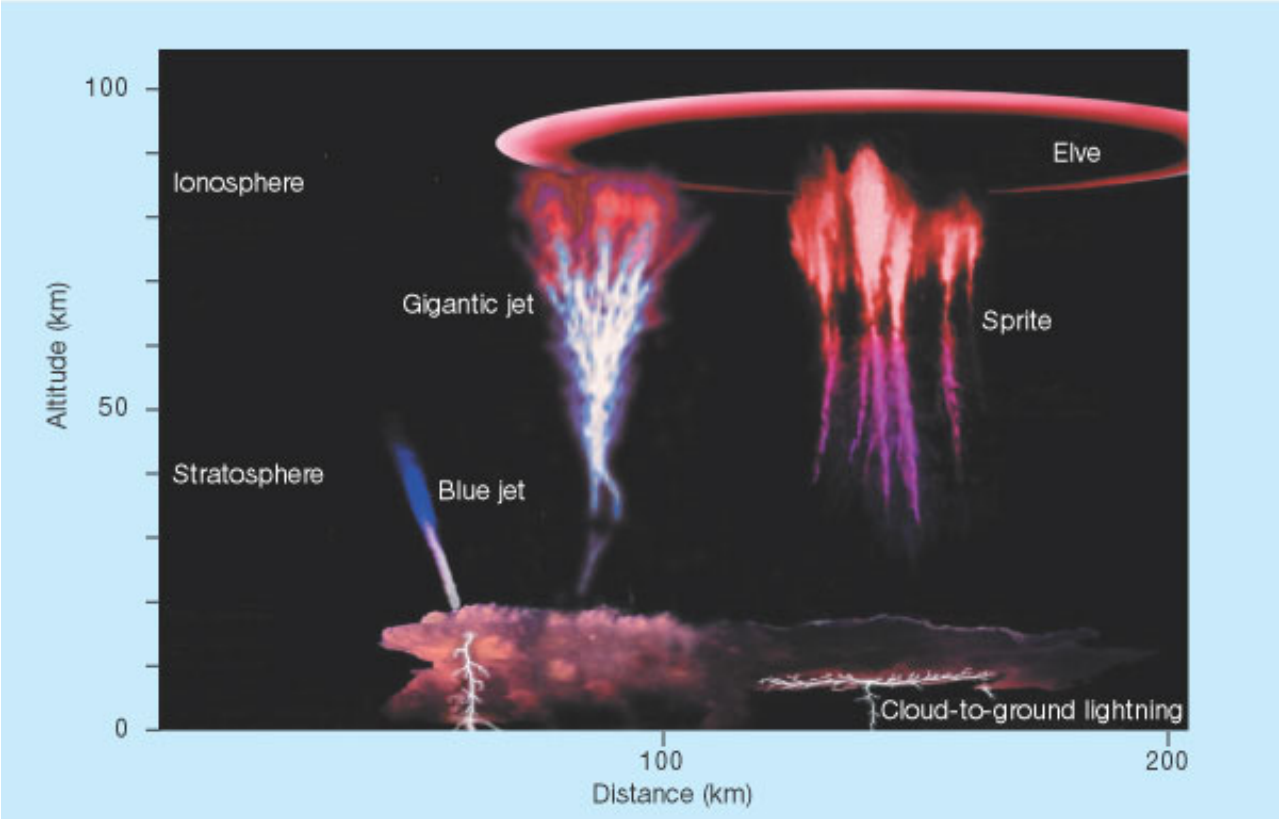

Figure 1: Lightning-related transient luminous events (TLEs), Pasko, Nature 423, 927-929 (26 June 2003)

Airborne infrared sounder can be used as a sensor to monitor military target using a limb line of sight. However, false alarm could occur, and the corresponding rate must be as low as possible. This explains importance to identify and characterize the potential causes of false alarm. In this way it is then possible to identify and eliminate them during their detection.

Transient luminous events (TLEs) were observed in the high atmosphere for the first time in 1990. Such phenomena could induce a false alarm. TLEs occur most of the time over thunderstorm clouds and they persist less than a second. Depending on their shape and their duration TLEs are called Sprites, Blue Jets, Elves, luminous halos and gigantic jets. The associated energized electrons excite, ionize or dissociate the major constituents of the Earth's atmosphere. Atomic or molecular species excited in electronic or vibrational states can induce various chains of chemical reactions and local enhancements of the concentrations of O_3, NOx (i.e. $NO+NO_2$), NO^+, and OH.

Energy deposition following a TLE event produces molecules in vibrationally excited levels. The local thermodynamic equilibrium is perturbed and it is then necessary to consider the population of each vibrational energy level individually in order to simulate the accurate radiative transfer of hot bands. This case is called Non Local Thermodynamic Equilibrium (NLTE).

The aims of this thesis will be to quantify the impact of TLEs on the chemical and vibrational atmospheric composition in order to deduce its effect on the atmospheric background radiance. For this, the successful applicant will develop a vibrational kinetic model. Then, he/she will couple this model with a full atmospheric chemical box model. It will allow predicting the disturbance of vibrational temperatures and of chemical concentrations by TLE discharges (blue jets, sprites).

The resulting work will allow modeling the infrared signature of TLEs. This radiation will be calculated on an altitude range corresponding to the studied TLEs, and then propagated to a limb viewing instrument at a distance of a few kilometers and an altitude of 10-15 km for an aircraft, 20-40 km for a stratospheric balloon.

The thesis will take place in close cooperation between the French aerospace lab ONERA/MPSO (modélisation physique de la scène optronique) and LATMOS (Laboratoire Atmosphère Milieux Observations Spatiales).

REQUIREMENTS

Dynamic and motivated student with M.Sc./Diploma and with skills in at least one of the following fields:

- Atmospheric Physic or chemistry,
- Radiative transfer,
- Molecular spectroscopy,
- Atmospheric remote sensing.

Lab languages are French and English. It is expected that the candidate will also col-laborate with external institutes.

APPLICATION

For further information or sent your application please contact sebastien.payan@latmos.ipsl.fr and Laurence.croize@onera.fr

Application (in English or in French) must include the following:

- A cover letter
- Curriculum vitae
- Diplomas – all relevant certifications
- Other information for consideration, e.g. list of publications (if any), letters of recommendation