High energy electron beams in the Earth environment: impact on the dynamics of the atmosphere/ionosphere coupled system

P.-L. Blelly[1], J.-A. Sauvaud[1]

[1] *IRAP, University of Toulouse, CNRS, Toulouse, France*

Atmospheric electricity and associated explosive phenomena have a direct impact on the Earth upper environment even far from the lower atmospheric layers. The radiation belts are perturbed by atmospheric storms as whistler waves associated with lightnings lead to a sink of the radiation belt energetic electrons into the atmosphere. Transient luminous Events (TLE) and particularly Terrestrial Gamma Flashes (TGF) are linked to the production of flashes of relativistic electrons possible escaping from the atmosphere/ionosphere system and populating the radiation belt. These electrons flashes are produced inside the atmosphere by the interaction of the propagating gamma beam with the constituents of the atmosphere and move up to altitudes where they are guided by the magnetic field lines. Both kind of electron beams have profound effects on the ionospheric layers as they modify the physical and chemical properties of the medium, particularly the composition and temperature leading for example to the escape of heavy ions from the lower ionosphere. We will review these processes in the framework of ongoing projects for the study of lightning induced electron precipitation and of Terrestrial gamma flashes and related runaway relativistic electrons.