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AMICal Sat, ATISE : From imagery to spectro-imagery for auroral studies

Mathieu Barthelemy[1], Vladimir Kalegaev[2], and Elisa Robert[1,3]
[1]UGA/ CSUG, Institut de Planetologie et d'Astrophysique de Grenoble, Grenoble, France (mathieu.barthelemy@univ-grenoble-alpes.fr)
[2]SINP-MSU, Moscow State University, Russian Federation
[3]SpaceAble, France

Space weather is a system science in the sense that it includes a chain of complex phenomena coming from the Sun and going to the Earth mainly through the magnetosphere. Added to this, the effects on the Earth infrastructures and their vulnerability should be taken into account. All this chain is too poorly described to allow accurate nowcasting and forecasting of the space weather events and of their effects on Earth. In this chain, the upper atmosphere as well as its interface with the magnetosphere require improvements in their description.

Precipitations of auroral electrons along magnetic lines lead to auroras, which are one of the most striking manifestations of space weather. These phenomena characterize the relationship of the magnetosphere and the upper atmosphere, and their intensity and localization indicate the state of near-Earth space. The energy release in the region of the auroral oval, associated with precipitation of auroral electrons, is controlled by the solar wind parameters and is one of the important reasons leading to changes in space weather in the polar magnetosphere and ionosphere.

In this frame, one of the main gaps in both data and modelling is the monitoring of the precipitation of low-energy (0.02 − 30keV) particles in the ionosphere and in the magnetosphere, especially electrons which are key contributors to ionospheric currents.

Numerous satellites observed the polar lights both in the UV and visible, however AMICal Sat is the first cubesat to be dedicated to the observation of the optical emissions of the auroras. It contains a sparse RGB imager and has been launched on board the VV16 flight, September 3rd 2020. It will be followed by a spectrometer ATISE planned to be launched in 2023.

In this presentation, we propose to present the first results of AMICal Sat, the data processing to extract the intensity of each lines and thus deduce the electron fluxes. Plans for ATISE developments and ground based tests will also be detailed.