Geophysical Research Abstracts
Vol. 21, EGU2019-15135-1, 2019
EGU General Assembly 2019

Using nadir-viewing photometric observations of sprites to infer properties of sprite streamers

Matthieu B Garnung (1,2), Sebastien Celestin (1), and Thomas Farges (2)
(1) LPC2E, University of Orleans, CNRS, France, (2) CEA, DAM, DIF, 91297 Arpajon, France

Nadir-viewing geometry is well-suited for sprite observation as it allows to simultaneously detect electromagnetic and particles emissions over the event. The downside is the loss of the vertical resolution making it harder for the determination of physical quantities like streamer altitudes.

Ihaddadene and Celestin [JGR, 112, 1000-1014, 2017] have developed a method to estimate the streamer peak electric field and the altitude from $\mathrm{N_2}$ and $\mathrm{N_2^+}$ sprite streamers optical emission: Lyman-Birge-Hopfield (LBH) ($\mathrm{a^1\Pi_g \rightarrow X^1\Sigma_g^+}$) ($\sim$100 nm$-$260 nm), the first positif system $1\,\mathrm{PN_2}$ ($\mathrm{B^3\Pi_g \rightarrow A^3\Sigma_u^+}$) ($\sim$650 nm$-$1070 nm), the second positif system $2\,\mathrm{PN_2}$ ($\mathrm{C^3\Pi_u \rightarrow B^3\Pi_g^+}$) ($\sim$330 nm$-$450 nm), and the first negative system of the $\mathrm{N_2^+}$ ion ($1\,\mathrm{NN_2^+}$) ($\mathrm{B^2\Sigma_u \rightarrow X^2\Sigma_g^+}$) ($\sim$390 nm$-$430 nm).

The instrument MCP on board the TARANIS space mission is dedicated to the observation of sprites through optical emissions by means of 2 cameras and 4 photometers. The detection of optical emissions by the four photometers is performed over specific bands: PH1 (160 nm$-$260 nm for LBH), PH2 (337 ± 5 nm for $2\,\mathrm{PN_2}$), PH3 (762 ± 5 nm for $1\,\mathrm{PN_2}$), and the lightning light by PH4 (600 nm $-$ 900 nm).

In this work, we improve the *Ihaddadene and Celestin*'s [2017] method taking into account the radiative transfer of sprite emissions through the Earth's atmosphere and the instrumental response of MCP.