Geophysical Research Abstracts
Vol. 21, EGU2019-9050, 2019
EGU General Assembly 2019

Hybrid-Vlasov modelling of nightside auroral proton precipitation with the Vlasiator global kinetic model

Maxime Grandin (1), Minna Palmroth (1,2), Markus Battarbee (1), Thiago Brito (1), Maxime Dubart (1), Urs Ganse (1), Yann Pfau-Kempf (1), and Lucile Turc (1)

(1) University of Helsinki, Helsinki, Finland (maxime.grandin@helsinki.fi), (2) Finnish Meteorological Institute, Helsinki, Finland

Relating particle precipitation characteristics to the magnetotail dynamics remains a challenge. No global kinetic simulations of the near-Earth environment have addressed it yet, while the spacecraft observations suffer from a small number of suitable conjunctions. Particle precipitation plays a key role in the coupling of the terrestrial magnetosphere and ionosphere by modifying the upper atmospheric chemistry, driving field-aligned currents, and producing aurora. Yet, quantitative observations of precipitating fluxes are limited, since ground-based instruments can only provide indirect measurements of precipitation while particle telescopes onboard spacecraft merely enable local observations and inherently coarse time resolution above a given location. On the other hand, global magnetospheric simulations can provide estimations of particle precipitation with a global view and higher time resolution. We present the first results of auroral (∼1–30 keV) proton precipitation estimation using the Vlasiator global hybrid-Vlasov model in a noon-midnight meridional plane simulation driven by steady solar wind with southward interplanetary magnetic field. At selected locations in the simulated nightside magnetosphere, we first calculate the bounce loss cone angle value. Then, using the velocity distribution function representation of the proton population at those selected points, we study the population inside the loss cone. This enables the estimation of differential precipitating fluxes as would be measured by a particle detector onboard a low-Earth-orbiting spacecraft. We discuss the time evolution of the parameters derived in this manner in the global nightside magnetospheric activity context in this simulation.