**Deep Learning Approach for Determination of Energetic Electron Precipitation Patterns in Low-Altitude Measurements**

A.S. Lukin 1,2 , X-J. Zhang 1,3 , A.V. Artemyev 3,2

1. The University of Texas at Dallas, Richardson, USA

2. Space Research Institute of Russian Academy of Sciences, Moscow, Russia

3. University of California, Los Angeles, Los Angeles, USA

Low-altitude spacecraft measurements provide the key dataset of precipitating energetic electrons, vitally important for multiple space weather models and for simulations of magnetosphere-ionosphere interaction. Determination and characterization of precipitation patterns for plasma sheet electrons (<30 keV) are well developed owing to an enormously huge dataset of DMPS fleet, whereas there is no comparably good technique for revealing patterns of energetic (>50 keV) electron precipitations. Electrons of such energies penetrate deeper into the atmosphere, affective conductance and ionization rate in E/D ionosphere layers. Historically, energetic electron precipitation dataset has been dominated by POES/MetOp satellite measurements, that have quite poor energy resolution and do not resolve energy distributions typical for different precipitation drivers, e.g. resonant scattering by whistler-mode waves and electromagnetic ion cyclotron waves, or scattering by magnetic field line curvature in the plasma sheet. However, rapid growth of low-altitude CubeSat measurements of energetic electrons with high energy resolution provide new opportunities for characterizing and quantification of energetic electron precipitation patterns. Therefore, a new methodology is needed for processing and analyzing such datasets. In our work we use the ELFIN CubeSat dataset that includes three years (2019-2022) of observations of precipitation and trapped electron fluxes with 50-6000 keV energy range and develop the deep learning model for automatic determination of typical precipitation patterns.