SAPS: Observations with the Hokkaido and King Salmon SuperDARN radars and modelling

A. Koustov[1,2], N. Nishitani[2], Y. Ebihara[2], T. Kikuchi[2], M. R. Hairston[3] and D. Andre[1]

[1] ISAS, University of Saskatchewan, 116 Science Place, Saskatoon, S7N 5E2 Canada (sasha.koustov@usask.ca)
[2] Solar-Terrestrial Environment Laboratory, University of Nagoya, Nagoya, Japan

[3] William B. Hanson Center for Space Sciences, University of Texas at Dallas, USA

The newly installed SuperDARN Hokkaido HF radar monitors ionospheric plasma flow between magnetic latitudes of 45^0 and 65^0 and thus has a great potential for studies of subauroral polarization streams (SAPS) in combination with another SuperDARN radar located at King Salmon, Alaska as well as the DMSP satellites and ground-based instruments in the Alaskan sector of the Arctic. Preliminary survey shows that although SAPS are often detected with the Hokkaido radar, their velocities are rather low, to the order 150 m/s in its most suitable central beams. In this study, observations of unusually fast Hokkaido flows of up to 800 m/s are investigated. The event of 1 April 2007 is investigated in detail. It is shown that high-velocity echoes appear after substorm onsets over North America with a delay of ~30 min. In terms of latitude, the velocity peaks just outside the auroral oval; signatures of a detached polarization jet are occasional and not pronounced. The King Salmon radar operating concurrently detects SAPS signatures as well but at different times and locations. Simulation with the inner magnetosphere model for the 1 April event reasonably identifies the period of fast flow occurrence but the velocity is underestimated. It is argued that substorm-injected particle populations intensify the pre-existing SAPS flow and leads to a mismatch of the predictions and observations.