Occurrence characteristics of subauroral westward plasma flows and slowest limit of SAPS observed by the Hokkaido HF radar

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Westward rapid plasma flows in the ionosphere at subauroral latitudes are called Sub-Auroral Polarization Stream (SAPS) [Foster and Burke, 2002]. SAPS is a manifestation of the Magnetosphere-Ionosphere (M-I) coupling. Therefore, it is important to know occurrence characteristics of SAPS in order to understand the details of M-I coupling system. SAPS is affected by storms/substorms. As a result of the analysis of SAPS using the SuperDARN Hokkaido HF radar, Kataoka et al. [2009] reported that positions of SAPS shifts toward lower latitude with decreasing Dst index. However, there are questions which are not yet solved, such as quantitative effect of storms / substorms on SAPS and slowest speed limit of SAPS. We investigate the characteristics of SAPS, with focus on the relationship between occurrence characteristics of SAPS and a variety of solar wind and geomagnetic parameters, using the SuperDARN Hokkaido HF radar with a field of view covering Far East Russia, which has been in operation since 2006. In particular we identified the lowest limit of SAPS speed, which has not been discussed in the previous literatures. This is to identify the lowest threshold of electric field to generate SAPS as a result of M-I coupling. In order to investigate SAPS occurrence characteristics comprehensively, we analyzed events with wider ranges of velocity and MLAT than those in the previous studies. As a result of statistical analysis of SAPS, we found two categories of westward flows that were reasonably separated with a speed threshold of ˜150-200 m/s. For the faster flows above the threshold there is a clear correlation between MLAT and Dst index, whereas for the slower flows there is no such correlation. Similar correlation is found for MLT and AL index for two categories of westward flows. The faster flows are considered to be SAPS, whereas the slower flows are probably associated with midlatitude F-region ionospheric irregularities not directly related to storms / substorms. Furthermore, we have been investigating the phase dependence of substorms identified by AL index, which represents the most intense value of the Auroral Electrojet as determined by the high latitude geomagnetic field data.