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Poleward-propagating magnetic perturbations in the cusp

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Poleward-propagating magnetic perturbations are often observed on the ground in the cusp latitudes. Some previous studies suggested that these phenomena are the ionospheric current signature of flux transfer events [e.g., Milan et al., 2000]. However, our recent study on the mesoscale plasma injection in the cusp, which is typical of a flux transfer event, has shown that poleward-propagating nature is not clear despite that a vortical feature is identified [Taguchi et al., 2010]. In this study, using large data set obtained from the Greenland magnetometer chain, we identify statistical characteristics of poleward-propagating magnetic perturbations in the daytime sector, and understand what produces this signature. We took poleward-propagating events using cross-correlation of data from different stations in the Greenland chain. Results from the statistical analysis of these events show that the occurrence frequency is high around 12 MLT, as is expected, and that a typical poleward propagation speed is 0.5-2 km/s, which is consistent with the convection velocity. What is interesting is that there are a significant number of events that occur both in the East and West chains with no time lag. This shows that the longitudinal extent is more than about 1,000 km, which is much larger than the extent of the typical scale size of the possible signature of a flux transfer event. The east-west component of the magnetic perturbations of these events is generally small, which suggests that the perturbations are not produced simply by the enhancement of the anti-sunward convection in the longitudinal wide extent. We will show the detailed characteristics of the poleward-propagating phenomena including the longitudinally wide events, and discuss what drives these phenomena.

Keywords: ground magnetic perturbations, ionospheric current, cusp, polar cap, IMF