Geophysical Research Abstracts
Vol. 19, EGU2017-4814, 2017
EGU General Assembly 2017

A self-consistent method of deriving polar ionospheric convection from eigenanalysis of SuperDARN radar data

Robert Shore and Mervyn Freeman
British Antarctic Survey, Cambridge, UK

Under the SuperDARN (Super Dual Auroral Radar Network) organisation, radar measurements of the polar ionospheric plasma motion have been increasing in number and coverage for the past two solar cycles. SuperDARN is an increasingly-rich data set with many users around the globe. We present the results of applying the meteorological analysis method of Empirical Orthogonal Functions (EOF) to a sample of radar data from SuperDARN. The EOF method is used to characterise and separate contributions to the variability of plasma motion in the northern polar ionosphere. EOFs decompose the noisy and sparse SuperDARN data into a small number of independent spatio-temporal basis functions, which collectively describe the majority of the variability in the plasma motion. We use these basis functions to infill where data are missing, providing a self-consistent description of the plasma velocity at the original temporal resolution of the SuperDARN data set.

The aim of our study is to resolve the large-scale ionospheric plasma convection associated with the Dungey cycle, and other modes. Specifically, we apply the EOF method to resolve these phenomena in a manner which we consider to be more self-consistent than existing SuperDARN interpolation methods. We present the new approaches we have developed in order to produce full-coverage maps of the plasma velocity. The study is a proof-of-concept applied to one month of data, aimed to test the methodology which will subsequently be applied to SuperDARN data spanning a full solar cycle.