



A characterisation of ionospheric velocity from small to global scales.

G. A. Abel (1), M. P. Freeman (1), G. Chisham (1) and N. W. Watkins (1)

(1) British Antarctic Survey, Natural Environment Research Council, Cambridge, U.K.
(gaab@bas.ac.uk)

It is widely acknowledged that features in the magnetospheric/ionospheric system are seen on a variety of scales. There is a growing body of evidence that many such features display some characteristics of scale free systems i.e. fluctuations are seen on all scales (below the global scale at least). Here we present a structure function analysis of 8 years of ionospheric line-of-sight velocity data from the Halley SuperDARN radar in Antarctica comparing contemporaneous measurements of meridional velocities at different range separations. We find strong evidence for scale free behaviour both poleward and equatorward the open-closed field line boundary, though with different scaling exponents, and show that it is possible to collapse the distributions of fluctuations at different separations to a single distribution using appropriate scaling. Due to the limitations of the measurements we have had to limit our distributions of fluctuations to 3 standard deviations to reveal the scale free behaviour. We investigate, using a fractional Lévy generator, the effect of this and other limitations on our ability to characterise a scale free system. A characterisation of this scale free behaviour could be utilised in global models to parameterise fluctuations on scales smaller than the model resolution.