Rapid Global Reconfiguration of the High-Latitude Ionosphere on 24 November 1996: An Objective Method for Determining Convection Change

M. L. Parkinson[1], M. Pinnock[2], N. Watkins[3], and P. L. Dyson[4]
[1]Department of Physics, La Trobe University, Victoria 3086, Australia,
m.parkinson@latrobe.edu.au
[2]British Antarctic Survey, Natural Environment Research Council, Cambridge CB3 0ET, UK
mpi@bas.ac.uk
[3]As (2) above, but E-mail: n.watkins@bas.ac.uk
[4]As (1) above, but E-mail: p.dyson@latrobe.edu.au

Abstract

Whether the high-latitude ionosphere responds gradually (~10 min) or "instantaneously" (<2 min), or both, to changes in the coupling between the solar wind and magnetosphere is an outstanding problem. It can be difficult determining exactly when a significant convection change has occurred, if at all, in measurements that are essentially nonstationary

time series data with an additional random (noise) component. Here we present an independent, objective method of determining if, and when, significant changes have occurred in ionospheric measurements. The method is applied to the HF backscatter radar data recorded on 24 November, 1996 [1], and confirms a coherent large-scale convection change occurred nearly "instantaneously" (2–4 min) over at least 11 hours of local time. Our simple analysis method can also be applied to similar problems when there is uncertainty about whether time series data has undergone a significant change.