Geophysical Research Abstracts
Vol. 15, EGU2013-1467, 2013
EGU General Assembly 2013

Phase-locking of lower atmosphere phenomena with space weather changes

Keri Nicoll and R. Giles Harrison
University of Reading, Meteorology, Reading, United Kingdom (k.a.nicoll@reading.ac.uk)

This work presents analysis of solar-terrestrial coupling using a new phase-locking technique, to detect characteristic signatures in solar variability expressed in atmospheric quantities. This method shows that, following changes in the heliosphere, phase-locked changes can be traced through energetic particles and into the lower atmosphere, specifically in the global electric circuit and cloud properties in the lower troposphere. The heliospherically-disturbed period of interest considered occurred during 2007-2009, when a characteristic 27 day variation in neutron monitor data was present, associated with a co-rotating interaction region (CIR). The neutron monitor data was itself phase locked to solar sector boundary changes. During the same period, phase-locked atmospheric electrical variations are apparent in the lower troposphere in the southern UK. Specifically, these include an increase in the vertical conduction current during increases in the neutron counter count rate, together with increases in energetic proton count rates. Suggestions have been made that extensive horizontal layer clouds can respond to conduction current density changes, due to the electrification expected at the base of layer clouds, which can influence droplet properties. We consider the evidence for this in cloud and surface meteorological measurements made at Lerwick Observatory, Shetland, by continued application of the phase-locked analysis method to the lower atmosphere data.