EMS Annual Meeting Abstracts
Vol. 10, EMS2013-503, 2013
13th EMS / 11th ECAM

Solar coupling to the lower atmosphere through atmospheric electricity

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

Clouds play a major role in the radiation budget of the Earth's climate system. Links postulated between solar activity and clouds have therefore attracted attention and controversy. Observing and quantifying the suggested physical mechanisms coupling solar variability with clouds and climate is an important contribution to this discussion. One potential route by which clouds may respond to solar influenced variations in high energy particle emissions is via the Global Atmospheric Electric Circuit. This possibility arises as a result of the current flow in the global circuit, which causes electrification at the upper and lower edges of extensive layer clouds. A vertical conduction current flow, Jz, is always present globally in fair weather, which is strongly modulated by solar activity. It effectively couples solar changes down through the lower atmosphere to the surface. Global circuit coupling to cloud droplets in layer clouds arises from classical physics considerations. Electrification of the cloud droplets can have implications for cloud microphysical processes, and potentially provides one source of variability in the macroscopic properties of clouds. This work will review the evidence for the Global Atmospheric Electric Circuit effect on clouds including a discussion of charge-influenced cloud microphysical processes. New cloud edge charging observations from a balloon borne sensor using a radiosonde system will be presented to demonstrate the typical magnitude and vertical distribution of charge present in layer clouds.