Geophysical Research Abstracts
Vol. 21, EGU2019-5721, 2019
EGU General Assembly 2019

Charge in the base of persistent extensive layer clouds and cosmic rays

R.Giles Harrison (1), Graeme Marlton (1), Keri Nicoll (1,2), and Karen Aplin (3)

(1) Department of Meteorology, University of Reading, UK (r.g.harrison@reading.ac.uk), (2) Department of Electronic and Electrical Engineering, University of Bath, UK, (3) Department of Aerospace Engineering, University of Bristol, UK

Horizontal layer clouds are common globally. If a layer cloud is extensive and persistent, it can acquire charge at the upper and lower cloud boundaries, from current flow in the global electric circuit. Positive charge at the upper cloud-air boundary and negative charge at the lower cloud-air boundary are expected from the electrostatic considerations associated with a conductivity transition. This charge structure has previously been observed using specially-instrumented radiosonde observations in a range of locations. An alternative route to finding the daily average charge density in the cloud base is possible for some low-level persistent layer clouds, through combining surface measurements of the surface potential gradient beneath the cloud layer with cloud base height measurements from a co-located laser ceilometer. Current flow in the global circuit and the air conductivity at cloud heights both increase with cosmic ray ionisation, which will modify the cloud-air conductivity transition and the associated cloud edge charge density. By analysing cloud base charge determinations made with the ceilometer charge technique from Reading between 2015 and the end of 2018, during which the cosmic ray ionisation increased with the approach to solar minimum, a variation in cloud base charge with cosmic ray ionisation can be identified, which is discussed further here.