Geophysical Research Abstracts
Vol. 17, EGU2015-5598-1, 2015
EGU General Assembly 2015

Droplet charging effects on the microphysics of layer clouds

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Charging of droplets occurs in layer clouds at the upper and lower cloud edges, through the vertical current flow associated with the global circuit. Observations of droplet charging recently obtained in these cloud regions are broadly consistent with electrostatics theory, but also depend on the structure of the cloud determined by the local thermodynamics and meteorology. The new observations provide some insight into the likely microphysical effects of the droplet charging, and indicate that it is the microphysical properties of small droplets which are most likely to be directly affected. However, the effect of charging on collision efficiencies of small droplets can, because of non-linear effects resulting from multiple droplet-droplets collisions, also affect the evolution of the droplet size distribution. This would have implications for the autoconversion to rain, and the associated cloud lifetime.