

Observations linking the global circuit with cloud processes and climate

Brian Tinsley[1]

[1] University of Texas at Dallas

www.utdallas.edu/physics/faculty/tinsley.html

A number of independent external and internal forcing agents for the global electric circuit, that affect the downward current density, J_z , that passes through clouds, show good correlations with changes in cloud cover and atmospheric temperature and dynamics. We analyze on events on the day-to-day timescale, where there is no ambiguity with meteorological responses to solar UV. Responses to J_z are found for several inputs due to solar activity that do not involve changes in galactic cosmic ray (GCR) flux, suggesting processes caused by variations in space charge at cloud boundaries, rather than by nucleation changes associated with changes in ionization rate. Also, a response is found to day-to-day changes in J_z that are largely due to internal atmospheric changes, due to variability in the global thunderstorm charging current to the ionosphere. On the time scale of decades through millennia the largest changes in J_z are expected to be due to changes in the GCR flux. Thus much of the climate forcing on long time scales may be due to the GCR flux affecting J_z .