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The Global Atmospheric Electric Circuit

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One of the oldest disciplines in Geophysical Sciences is the monitoring of electrical properties of the atmosphere. Since the early 20th century we know of the existence of a fair weather electric potential of ∼100V/m at the Earth's surface, with currents of ∼2pA/m2 flowing to the Earth constantly. It was also shown early on that the diurnal variability of these electrical parameters is the same irrelevant of the location of the measurement. This universal time variation, called the Carnegie Curve, was soon related to the global variations of thunderstorm activity across the Earth. The thunderstorms act as batteries that charge a huge spherical capacitor between the Earth's surface and the ionosphere. These DC characteristics of the global circuit also have an AC component known as the Schumann resonances. Since the DC and AC components are global electric indices related to global thunderstorm activity, they provide a means of monitoring global weather and climate from a single location on the Earth's surface. Hence, the electric circuit can be used to monitor changes in the weather and climate, while changes in the upper atmosphere (ionosphere) due to solar storms can also be monitored using the AC portion of the circuit. The DC and AC components of the global atmospheric electric circuit will be discussed in this presentation.