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Enhancing the atmospheric electric current through clouds to increase low latitude marine stratocumulus cloud cover

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A current density, Jz, of 1-6 picoamperes per square meter flows downwards through clouds all over the globe as part of the global electric circuit. Jz produces space charge in gradients of conductivity associated with gradients in droplet concentration, at the boundaries of clouds and within them, consistent with Ohm's and Gauss's Law. Increases in Jz and space charge in clouds reduces the rate of in-cloud and below-cloud Brownian scavenging of the smallest cloud condensation nuclei (CCN), based on well-known cloud microphysical theory. For relative humidity less than 100% there is phoretic scavenging which is also reduced by this charge modulation of aerosol scavenging (CMAS) (Tinsley, Rep. Prog. Phys, 71, 066801, 2008). Increased concentration of the CCN reduces average droplet size and increases their concentration and the cloud cover (Twomey effect). The CMAS process is consistent with correlations, with high statistical significance, of a variety of cloud and atmospheric dynamical parameters with Jz changes, and is consistent with changes in low-altitude low-latitude clouds over the solar cycle as observed by Svensmark (but with a different interpretation). The complexity of the cloud microphysics and variability and uncertainty concerning aerosol concentrations and size distributions has made quantitative modeling in cloud resolved models difficult so far.
Technology to increase Jz and increase daytime cloud cover and outgoing shortwave radiation includes using arrays of floating stations to increase the conductivity in the lowest 1-2 km above the ocean surface, with ion generators like scaled-up room air ionizers. The lifetime of the ions is a few hours, so daytime-only operation allows the return to reduced cloud cover at night to increase the outgoing longwave radiation.