

An Overview of the Radiation Budget in the Lower Atmosphere

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The radiation budget at the top-of-atmosphere is relatively well understood from satellite observations such as those made by Nimbus-7, ERBE, CERES and SORCE, especially when compared to that at surface and lower atmosphere. For example, the accuracy and annual variability in total solar irradiance is known to within a few tenths of a percent and for top of the atmosphere albedo, about 1%. By contrast, the range of estimates for the surface radiative energy budget vary by more than 10% between satellite remote sensing and model simulations, and it is difficult to quantify the absolute uncertainties associated with the individual terms. Using results from a number of recent airborne field campaigns and from satellite observations, we will assess the current state of knowledge of the lower atmosphere radiative energy budget with particular attention on where solar radiative energy is deposited in the system. We also present simulations of variability in direct solar heating of the lower atmosphere in response to varying levels of solar activity as measured by the SORCE Solar Irradiance Monitor (SIM).