IRS2012-46
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012

Cloud liquid water path: Revisiting an essential but under-utilized climate variable

R. Bennartz (1) and C. W. O'Dell (2)

(1) University of Wisconsin - Madison (bennartz@aos.wisc.edu), (2) Colorado State University (odell@atmos.colostate.edu)

Cloud liquid water path (LWP) is a key variable for understanding cloud climate interactions. Reasons for this are related to (1) the role of cloud liquid water path in cloud microphysical and radiative properties, (2) the availability of long-term passive microwave observations, and (3) the objective nature of the definition of LWP as compared e.g. to the more subjective nature of the definition of cloud fraction. As a result, LWP provides an excellent diagnostic for Global Climate Model (GCM) validation. For example, parameterizations of warm rain processes in GCMs can much better be validated against LWP climatologies than against precipitation because LWP in thin clouds responds strongly to changes in warm rain processes whereas precipitation mostly responds to large-scale moisture flux convergence.

In 2008 the authors have developed and released the UWisc LWP climatology based on all conically scanning microwave radiometers available at the time, including SSM/I, AMSR-E, and TMI. This 20-year climatology is becoming a de-facto standard for GCM validation with a growing user community of currently more than twenty different research groups, most of which are climate modelers. Despite the success of this climatology, various open issues could not be fully resolved at the time. These issues include the treatment of different absorption models, propagation, subscale cloud variability, rain-cloud separation, as well as rigorous error propagation. This presentation will highlight the current state of the art of satellite-based liquid water path retrievals, show application examples, and lay out a path to derive an improved climatology that accounts for the aforementioned open issues.