Ten Years of Cloud Properties from MODIS: Global Statistics and Use in Climate Model Evaluation

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ABSTRACT:

The NASA Moderate Resolution Imaging Spectroradiometer (MODIS), launched onboard the Terra and Aqua spacecrafts, began Earth observations on February 24, 2000 and June 24, 2002, respectively. Among the algorithms developed and applied to this sensor, a suite of cloud products includes cloud masking/detection, cloud-top properties (temperature, pressure), and optical properties (optical thickness, effective particle radius, water path, and thermodynamic phase). All cloud algorithms underwent numerous changes and enhancements between for the latest Collection 5 production version; this process continues with the current Collection 6 development.

We will show example MODIS Collection 5 cloud climatologies derived from global spatial and temporal aggregations provided in the archived gridded Level-3 MODIS atmosphere team product (product names MOD08 and MYD08 for MODIS Terra and Aqua, respectively). Data sets in this Level-3 product include scalar statistics as well as 1- and 2-D histograms of many cloud properties, allowing for higher order information and correlation studies.
In addition to these statistics, we will show trends and statistical significance in annual and seasonal means for a variety of the MODIS cloud properties, as well as the time required for detection given assumed trends. To assist in climate model evaluation, we have developed a MODIS cloud simulator with an accompanying netCDF file containing subsetted monthly Level-3 statistical data sets that correspond to the simulator output. Correlations of cloud properties with ENSO offer the potential to evaluate model cloud sensitivity; initial results will be discussed.