Assessing progress in global cloud simulations from IPCC AR4 to AR5 using ""A-Train"" observations

Jonathan Jiang[†]; Hui Su; Vincent Perun; Chengxing Zhai
[†] California Institute of Technology, USA
Leading author: Jonathan.H.Jiang@jpl.nasa.gov

Using NASA "A-Train" satellite measurements, we evaluate model simulations of ice and liquid clouds that were submitted for the IPCC AR5 and AR4. Comparisons between observations and model outputs are made in terms of total cloud fraction (TCF), ice/liquid water path (IWP/LWP), vertical profiles of cloud fraction (CF) and ice/liquid water content (IWC/LWC), and their probability density functions (PDFs). The modeled TCFs are in good agreement with observations within ~10% in global average, with the largest differences (up to 25%) in the high latitudes poleward of 60∞ latitude. We also found significant improvement in IWP and LWP simulations in a few models (e.g. GISS-E2-R, NCAR-CCSM4) from AR4 to AR5, with their differences from observations within a factor of ~2 in CMIP5, comparing to more than a factor of 10 discrepancies reported for AR4. Analysis of vertical distribution of CF, IWC and LWC reveals large spread among models and departures from CloudSat, CALIPSO and Aura MLS observations, but improvements in the model simulations are notable.