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QUANTIFICATION OF UNCERTAINTY IN CLOUD FRACTION ESTIMATES, AND EVALUATION OF NWP REANALYSES IN MODELING CLOUD PROPERTIES

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ABSTRACT

Uncertainty in cloud fraction estimates has been a vexing problem for evaluation of climate models. For facilitating evaluation of model results against observations for the FAst-physics System TEstbed and Research (FASTER) project, here we quantify the range of uncertainty in cloud fraction estimates by examining a variety of decadal-long surface- and satellite- based cloud fraction estimates over the Southern Great Plains (SGP) region of the United States. Causes of the discrepancy between different cloud fraction estimates are also examined. In addition to the quantification of uncertainty in these cloud fraction estimates, we conduct a detailed analysis for evaluating three major NWP reanalyses in simulating surface shortwave cloud forcing and cloud fraction by using decade-long surface-based continuous measurements of the US Atmospheric Radiation Measurement (ARM) program over the SGP site. The three reanalyses evaluated are NCEP/NCAR Reanalysis I, NCEP/DOE Reanalysis II, ERA-Interim. Model biases of the three reanalyses in simulating the two cloud properties and their potential link to surface meteorological conditions are investigated. Also, the overall performance of the three reanalyses in simulating the two cloud properties is evaluated by using a combined statistical analysis.