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QUANTIFYING UNCERTAINTY IN CLOUD FRACTION OBSERVATIONS OVER THE SOUTHERN GREAT PLAINS

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ABSTRACT

Different methods have been used to measure cloud fraction, and there is an increasing need to quantify the range of uncertainty associated with these observations to facilitate evaluation of model results against observations. Here we use the most recent decade-long surface- and satellite- based observations over the Southern Great Plains (SGP) region of the United States to investigate uncertainties in estimates of cloud fraction. Our results show that non-negligible differences exist between these SGP cloud fraction estimates. The major sources of these differences are examined including variations in the measurement methods and/or retrieval algorithms. Observational data examined in this study include the three cloud fraction estimates from the Atmospheric Radiation Measurement (ARM) programs' Climate Modeling Best Estimate (CMBE) value added products: (1) From surface-based, vertically pointing remote sensing observations (ARSCL: Active Remote Sensing of Clouds), (2) From a surface-based hemispheric imager (TSI – Total Sky Imager), and (3) from geostationary satellite observations (GOES - Geostationary Operational Environmental Satellite). We also employ cloud fraction estimates from hemispheric radiometer observations (SIRS - the Solar Infrared Radiation Station) and the two different satellite-based cloud fraction products: ISCCP - the International Satellite Cloud Climatology Project, and PATMOS-x - Pathfinder Atmospheres Extended. These results will be useful for evaluating and improving cloud parameterizations in climate models.