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RACORO LONG-TERM, SYSTEMATIC AIRCRAFT OBSERVATIONS OF BOUNDARY LAYER CLOUDS

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ABSTRACT

Our knowledge of boundary layer cloud processes is insufficient to resolve pressing scientific problems. Boundary layer clouds often have liquid-water paths (LWPs) less than 100 gm^2, which are defined here as being "thin" Clouds with Low Optical Water Depths (CLOWD). This type of cloud is common globally, and the Earth's radiative energy balance is particularly sensitive to small changes in their optical properties. However, it is difficult to retrieve accurately their cloud properties via remote sensing because they are tenuous and often occur in partly cloudy skies. This interferes with our ability to obtain the routine, long-term statistics needed to improve their representation in climate models. To address this problem, in-situ data are needed to investigate cloud processes and to evaluate and refine existing retrieval algorithms.

Coordinated by the ARM Aerial Facility (AAF), the Routine AAF CLOWD Optical Radiative Observations (RACORO) field campaign conducted long-term, systematic flights in boundary layer, liquid-water clouds over the ARM Southern Great Plains (SGP) site between 22 January and 30 June 2009. This was the first time that a long-term aircraft campaign was undertaken for systematic in-situ sampling of cloud properties. Using the CIRPAS Twin Otter aircraft equipped with a comprehensive set of instruments to measure solar and thermal radiation, cloud microphysics, aerosol properties and atmospheric state, the RACORO team logged an unprecedented 59 flights and 259 research hours above the SGP site. Data gathered during the RACORO campaign will provide researchers with a statistically relevant data set of boundary-layer cloud and aerosol properties for future study. These data can be used to validate retrieval algorithms and support process studies and model simulations of boundary layer clouds and, in particular, CLOWD-type clouds. In addition to cloud observations, complementary clear-sky flight patterns were conducted to map the surface albedo, characterize the aerosol and cloud condensation nuclei, and study boundary layer turbulence. For RACORO to operate as a routine, long-term program, flight operations had to be kept as simple as possible to achieve its objectives, which required an operating paradigm different from typical, short-term, intensive aircraft field programs. This poster summarizes RACORO operations, measurements and instruments. URL: http://acrf-campaign.arm.gov/racoro/
