RACORO

Routine ARM Aerial Facility (AAF) Clouds with Low Optical Water Depths (CLOWD) Optical Radiative Observations

Steering Committee

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The CIRPAS Twin Otter is the workhorse for RACORO.

SUMMARY

The RACORO field campaign is conducting long-term, systematic flights in boundary layer, liquid-water clouds over the ACRF Southern Great Plains site. The data collected by RACORO will be available to ACRF users to:

1. **Validate ACRF Remotely-Sensed Cloud Properties**
2. **Investigate Aerosol-Cloud Interactions**
3. **Improve Cloud Simulations in Climate Models**

Long-term observations are needed to obtain representative statistics of these frequently broken or tenuous clouds:

- **Operations from 22 January to 30 June 2009 (~ 5 months)**
- **First-time, long-term aircraft sampling of cloud properties**
- **Requires simplified operating paradigm – different from typical, short-term, intensive aircraft field programs.**

1. FLIGHT PATTERNS

Standard pattern meets sampling needs for radiation, cloud and aerosol objectives:

- **In-cloud sampling: Triangular patterns within cloud and spirals over the SGP**
- **Boundary conditions: Triangular patterns below and above cloud**

Other patterns support RACORO analyses:

- **Surface albedo mapping**
- **CCN characterization**
- **Boundary layer turbulence structure**

2. MEASUREMENT NEEDS & INSTRUMENTS

Cost-effective, routine observations requires probes with:

- **A track record of reliability**
- **Require minimal maintenance, and**
- **Relatively routine processing by automated means.**

To obtain the fast response times needed to sample tenuous or broken clouds, we often paired a fast, precise instrument with a slower, accurate instrument.

CATEGORY	MEASUREMENT	INSTRUMENT	PRINCIPAL INVESTIGATOR
CLOUD MICROPHYSICS	Liquid-Water Content	Particle Volume Monitor-100A	CIRPAS
		SEA Liquid-Water Content Probe	CIRPAS
	Drop Size Distribution	Forward Scattering Spectrometer Probe-100	CIRPAS
		Cloud Aerosol Precipitation Spectrometer	CIRPAS
		2D Cloud Imaging Probe)	CIRPAS
		2D Stereo Probe	Paul Lawson
	Cloud Extinction	Cloud Integrating Nephelometer	Hermann Gerber
RADIATION	Broadband fluxes	↑↓ Shortwave Kipp & Zonen	Anthony Bucholtz & Chuck Long
		↑↓ Longwave Kipp & Zonen	Anthony Bucholtz & Chuck Long
		↑ SPN-1	Anthony Bucholtz & Chuck Long
	Spectral fluxes	↑↓ Multi-filter Radiometer	Anthony Bucholtz & Chuck Long
		↑↓ HydroRad-3	Anthony Bucholtz & Chuck Long
	Spectral Radiances	↑ or ↓ HydroRad-3	Anthony Bucholtz & Chuck Long
		↑↓ Infrared Thermometer	Anthony Bucholtz & Chuck Long
AEROSOL	Cloud Condensation Nuclei	Dual-Column CCN Spectrometer (0.2% SS, Scan 0.8-0.2% SS)	CIRPAS
	Number Concentration	Ultrafine Particle Counter	CIRPAS
		2 Condensation Particle Counters	CIRPAS
	Size Distribution	Scanning Differential Mobility Analyzer	Don Collins
		Passive Cavity Aerosol Spectrometer Probe	CIRPAS
METEOROLOGY	Temperature	Rosemount Probe	CIRPAS
		Vaisala Probe	CIRPAS
	Water vapor	Chilled Mirror Hygrometer	CIRPAS
		Diode Laser Hygrometer	Glenn Diskin
	Wind-Turbulence and Updraft velocity	Gust probe	CIRPAS
	Conditions	Flight video	CIRPAS

↑↓ Indicate the viewing direction of the radiometer

3. OPERATIONS

Personnel rotations for:

- **AAF point of contact at Guthrie**
- **Steering committee 2-week stints: 1 week co-PI, 1 week PI**

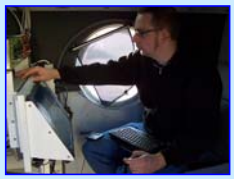
Forecasters

- **Daniel Hartsock**
- **Jason Tomlinson**
- **Justin Monroe**

RACORO Wiki keeps running, final record of flight summaries

Field Experiment Collaborations:

- **SGP Ground-based Cloud Tomography Experiment (Huang) Overfly scanning microwave radiometer array, May-June**
- **NASA King Air B200 Research Aircraft (Ferrare), June Overflies Twin Otter, providing complementary observations of aerosol and cloud microphysical properties**



4. DATA MANAGEMENT

CIRPAS Data Quicklooks

- **1st processing by Haf Jonsson and Anthony Bucholtz**
- **Automated plots by Chaomei Lo and Jennifer Comstock**

Data QC tracked regularly on RACORO Wiki QC table

Data Versions

- **v1: Within days of a flight; used for 1st-order QC (1 Hz for most fields)**
- **v2: Within two weeks of flight; used for quantitative assessment (up to 10 Hz)**
- **v3: Public data release 1 January 2010 (1 Hz and 10 Hz where applicable)**

RACORO Web page: http://acrf-campaign.arm.gov/racoro/