FASTER-RACORO Experiments

RACORO

R outine
A RM Aerial Facility (AAF)
C louds with Low Optical Water Depths (CLOWD)
O ptical
R adiative
O bservations

Website: **http://acrf-campaign.arm.gov/racoro/**

Supporting Documentation:

FASTER-RACORO White Paper Yangang sent to the FASTER Team

Wed Poster: RACORO Aircraft Data Case Study Development for FASTER

RACORO BAMS article (In press, Early online release)

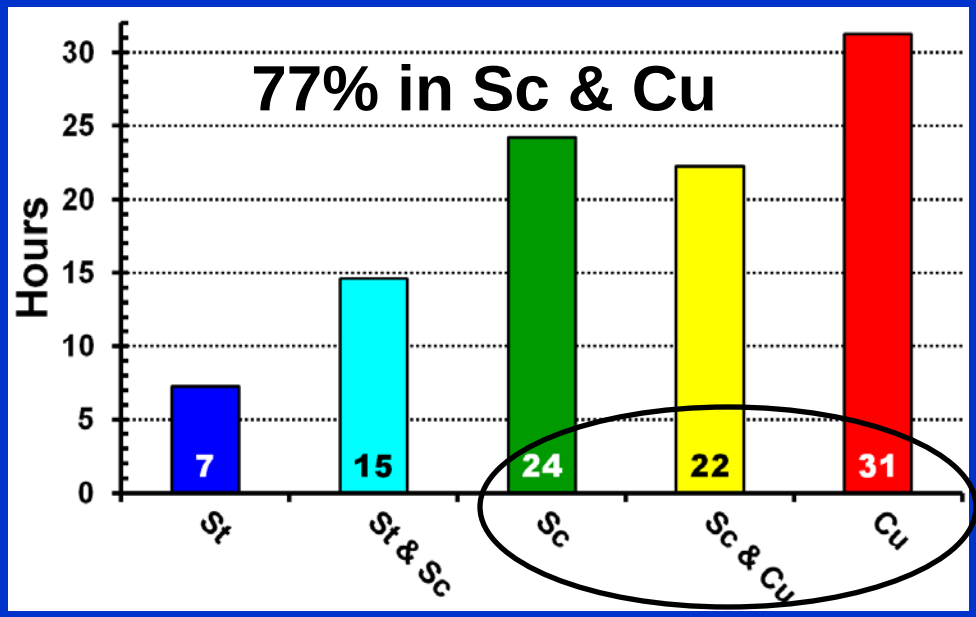
Updated RACORO Data Guide (v2)

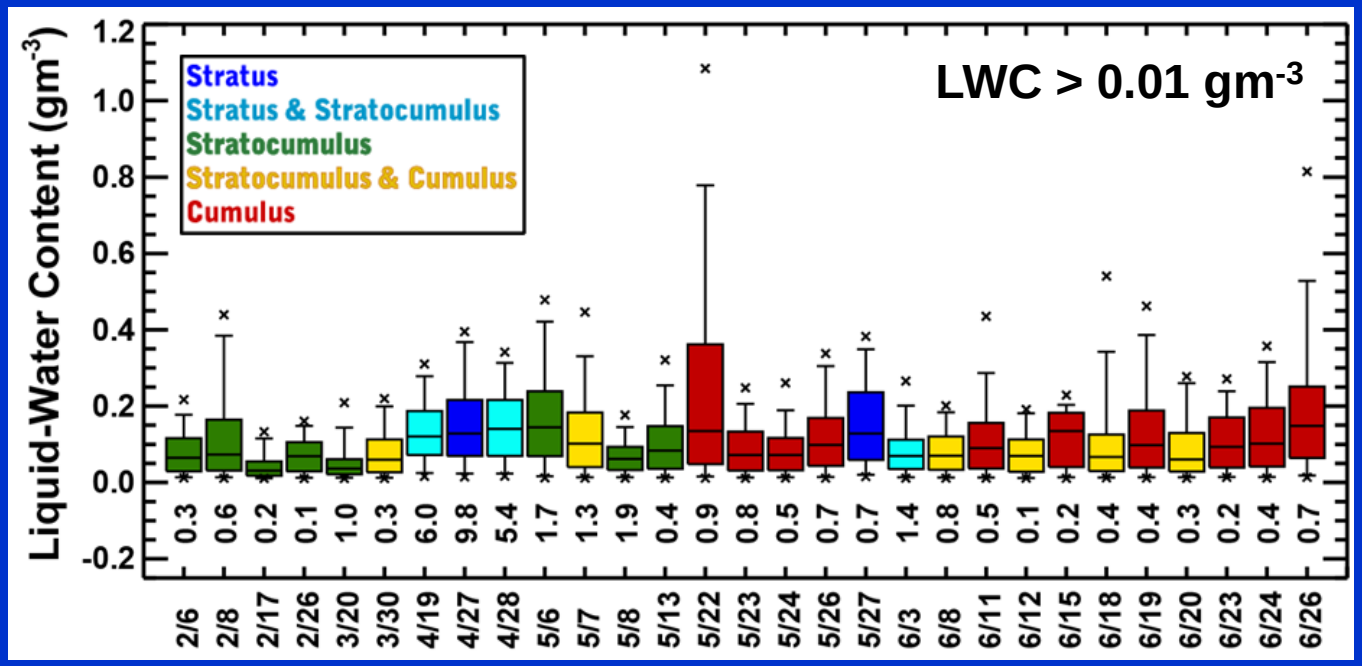
RACORO, and What can it contribute to FASTER?

- **5-Month aircraft campaign over the SGP obtaining boundary layer, liquid-water cloud field statistics (Long legs, 2xProfiles)**
  - **Microphysical properties**
    LWC, Drop size distribution
  - **Aerosol properties**
    CCN, Size distributions, Number concentrations
  - **Atmospheric state**
    Temperature, Water vapor, Vertical velocity, Turbulence
  - **Radiative fluxes and Optical properties**
    Cloud extinction, Reff, SW & LW fluxes

- **Other Data**
  - SGP Observations
    - Variational analysis
  - King Air Flights (HSRL, RSP)
  - Tomography IOP (Dong Huang)
  - EOS Overpasses

What We Have


77% in Sc & Cu
Hours
30
25
20
15
10
5
0
7
15
24
22
31
St
St & Sc
Sc
Sc & Cu
Cu


Liquid-Water Content (gm-3)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
Stratus
Stratus & Stratocumulus
Stratocumulus
Stratocumulus & Cumulus
Cumulus
LWC > 0.01 gm-3
0.3 0.6 0.2 0.1 1.0 0.3 6.0 9.8 5.4 1.7 1.3 1.9 0.4 0.9 0.8 0.5 0.7 0.7 1.4 0.8 0.5 0.1 0.2 0.4 0.4 0.3 0.2 0.4 0.7
2/6 2/8 2/17 2/26 3/20 3/30 4/19 4/27 4/28 5/6 5/7 5/8 5/13 5/22 5/23 5/24 5/26 5/27 6/3 6/8 6/11 6/12 6/15 6/18 6/19 6/20 6/23 6/24 6/26

Overview of Proposed FASTER-RACORO Experiment Plan

Multi-Pronged Approach:

1. SCM and NWPs

Examine the full RACORO period

2. High-resolution modeling (LES, CRM)

Examine selected "golden" cases 1st, broaden as conditions allow

3. Observations (aircraft, surface, satellite)

Data integration and model evaluation

4. Aerosol Data Assimilation

Z. Li's presentation (previous) and poster

Large-Scale Forcing

Variational analyses: Hrly RUC data constrained by SGP obs

- Standard domain: (280 km)^2, 25-mb vertical resolution up to 100 mb, Hourly
- Include surf. & upper-air met. fields, and large-scale advec of heat & moisture

Also considering:

- High-Res domain: (75 km)^2, 10-mb vertical resolution up to 100 mb, Hourly
- Finely-tuned forcings: That reproduce aspects of the thermo evolution
- Ensemble (perturbed) forcings

Golden Cases Selected for 1st Ref'nce

Selection criteria:

- **Well sampled (instruments A-OK)**
- **Preferred (i.e., being picky)**
  - o **Multi-day periods**
  - o **And/or "archetype"**
- **Easier above-cloud radiation boundary conditions**

Primo Cases

Cloud Type	When	What's so special about it?
St & Sc	**April 19**	**Great transition case: St → Sc → Clear**
St & Sc	**April 27-28**	**Best drizzle case: CCN drops 400 → 130 cm^{-3}**
St, Sc & Cu	**May 6-8**	**Range of conditions: St → Sc, St & Cu, Sc**
Cu, Cu & Cu!	**May 22-26**	**Great Cu period: W ~1 m s^{-1}, CCN 600 → 170 cm^{-3}**
St	**May 27**	**Thick, weakly precipit'ng St: CCN low (280 cm^{-3})**
Sc & Cu	**June 18-21**	**Exten'd period St & Cu: CCN low (160-250 cm^{-3})**

Still Good Cases, but runners up

Cloud Type	When	What's so special about it?
Sc	**March 20**	**Very optically thin Sc: Multi-level, CCN levels high (520 cm^{-3})**
St & Sc	**June 3**	**Good St & Sc case: Overcast to scattered Cu**
Sc & Cu	**June 8-9**	**Highish CCN case (480 cm^{-3}): Cu sampled best on 6/8**
Cu	**June 11**	**One of the lowest CCN cases (170 cm^{-3}): W ~ 1 m s^{-1}, and median LWC low (0.09 g m^{-3})**
Sc & Cu	**June 22-26**	**CCN ~triples during period (210 to 590 cm^{-3}): Scattered Cu whose median LWC increases steadily during the period (0.09 to 0.15 g m^{-3})**

Sensitivity of In-Situ Sampling – Implications to MWR LWPs