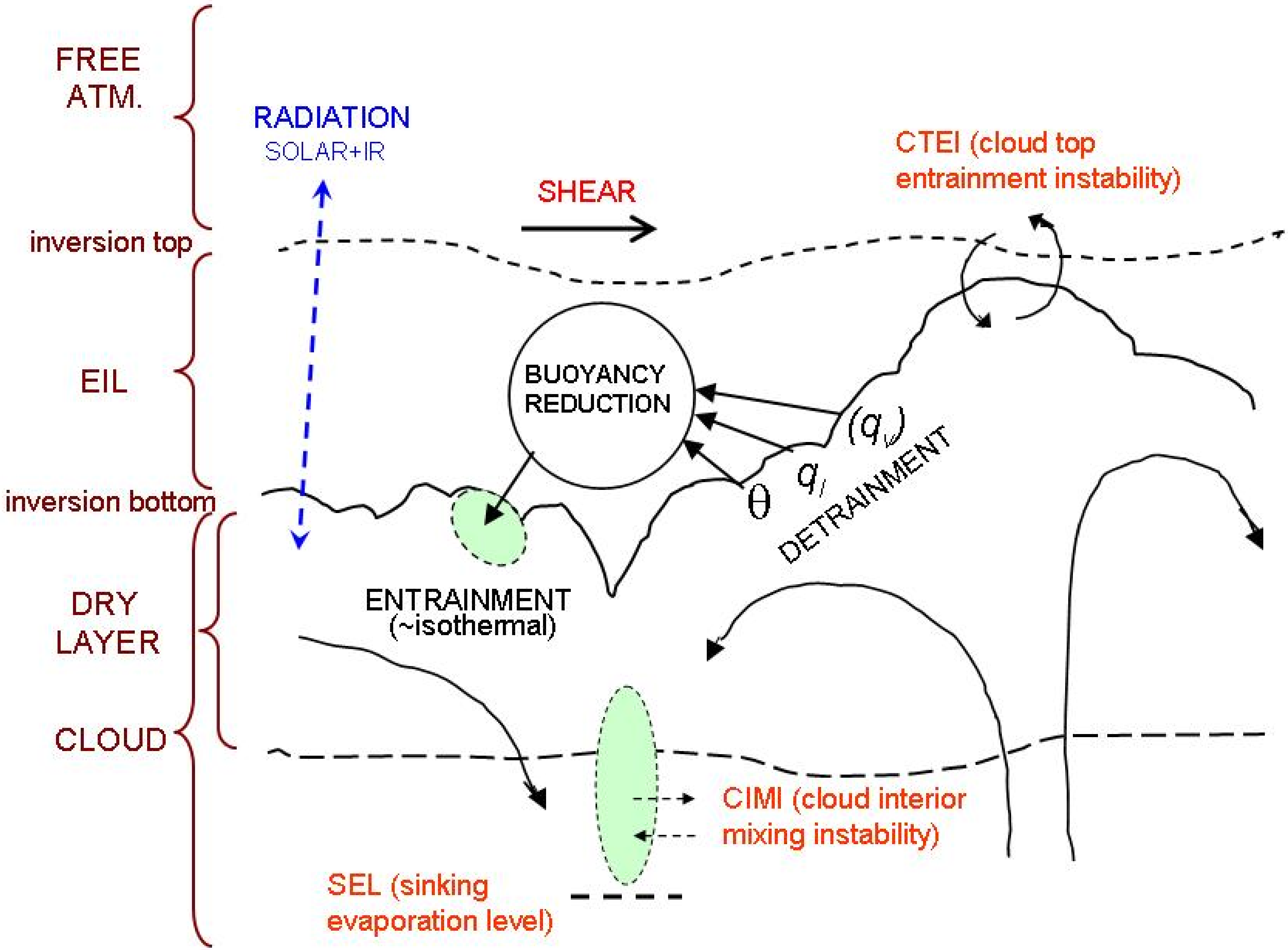
POST (Physics of Stratocumulus Top)

2. Overview and Goals

H. Gerber, S. Krueger

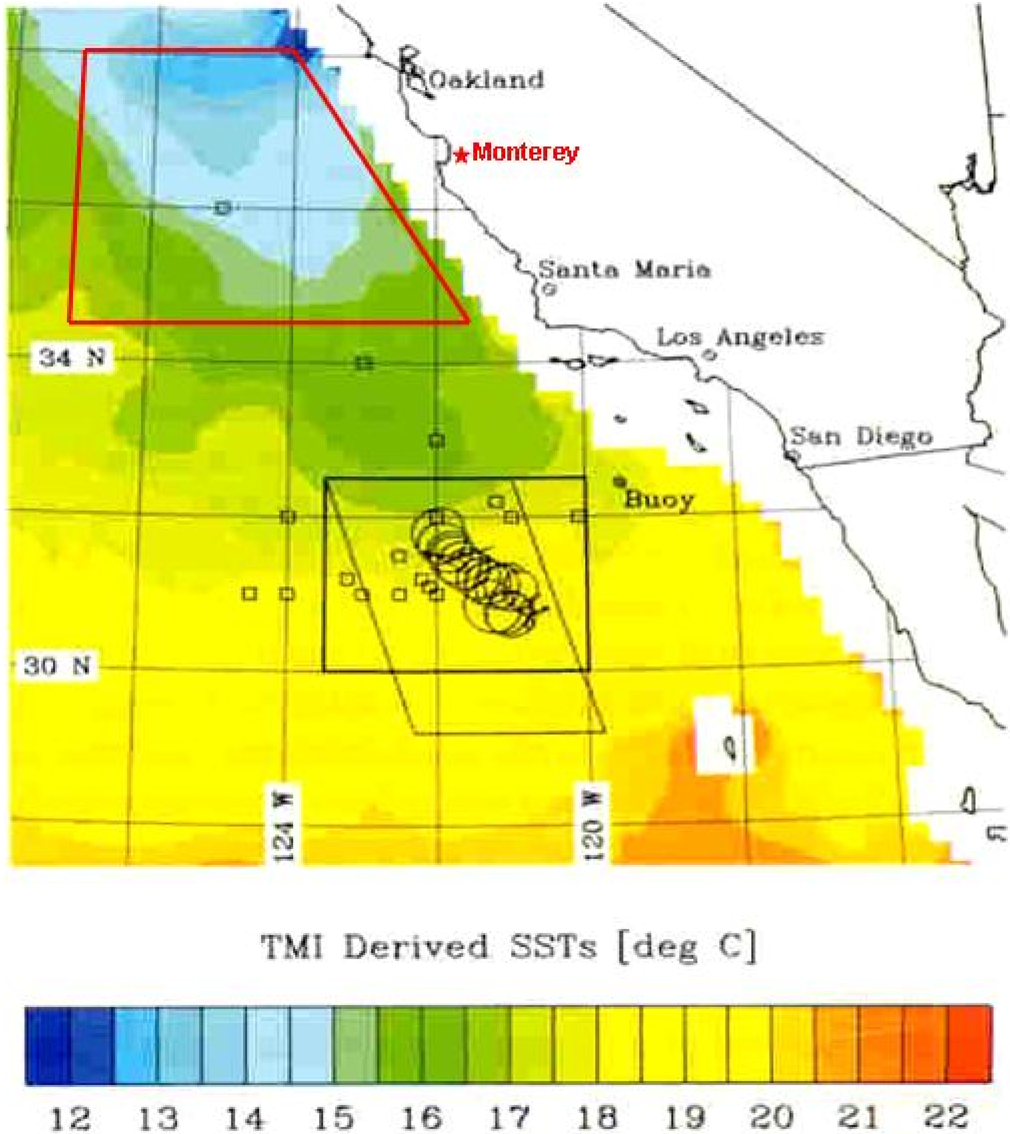


FREE
ATM.
inversion top
EIL
inversion bottom
DRY
LAYER
CLOUD
RADIATION
SOLAR+IR
SHEAR
CTEI (cloud top
entrainment instability)
BUOYANCY
REDUCTION
(q_l)
q_l
θ
DETRAINMENT
ENTRAINMENT
(~isothermal)
CIMI (cloud interior
mixing instability)
SEL (sinking
evaporation level)

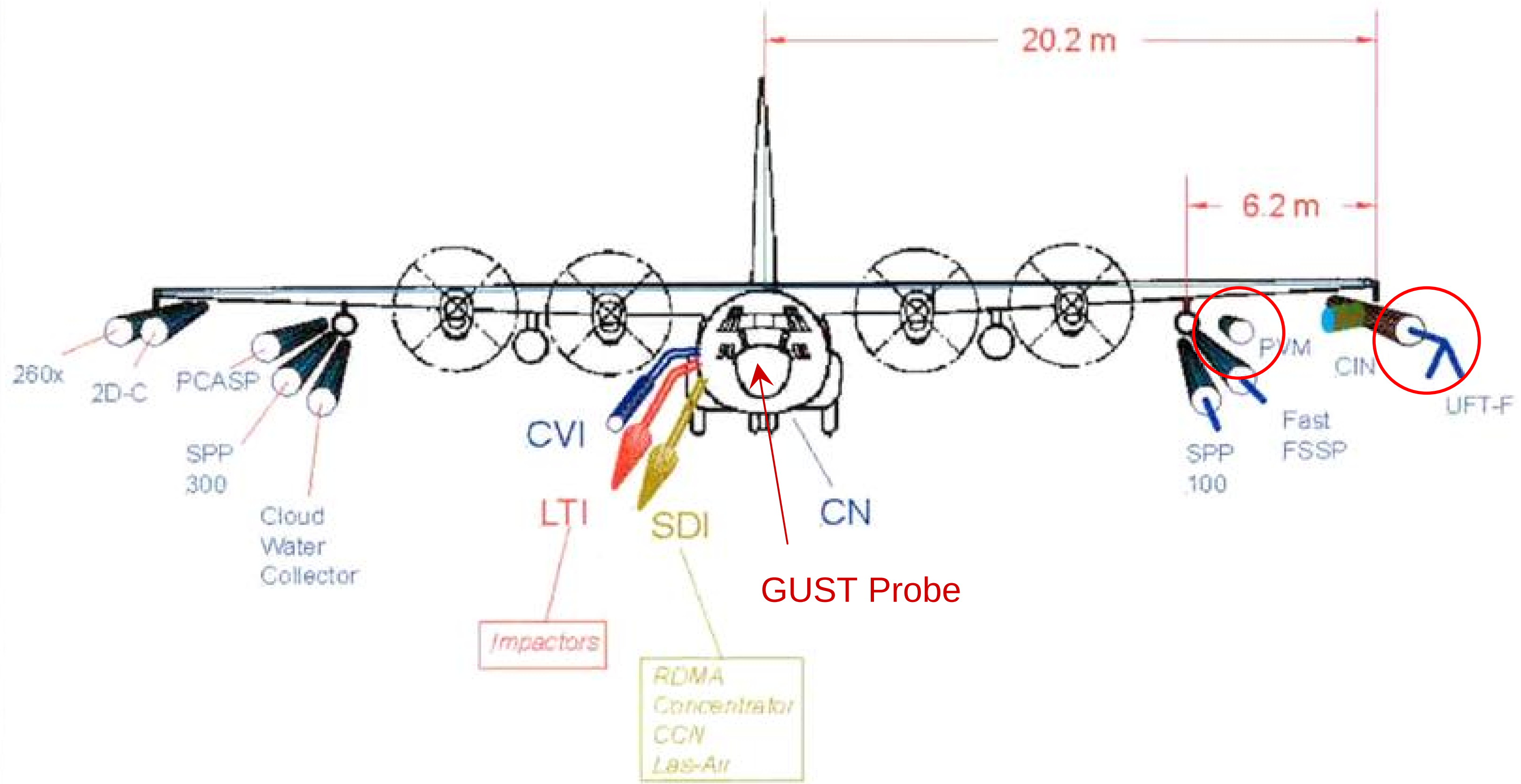
POST HYPOTHESES

- Cool, moist, cloud-free air from the EIL is the source of air entrained into cloud top
- Details of cloud-top interface are necessary for accurate w_e estimates
- Evaporation of LWC by entrained air contributes to buoyancy production
- Modeling from microphysical- to meso-scales compares favorably with POST observations

DYCOMS II (Stevens et al., *B.A.M.S.*, 2003, **38**)

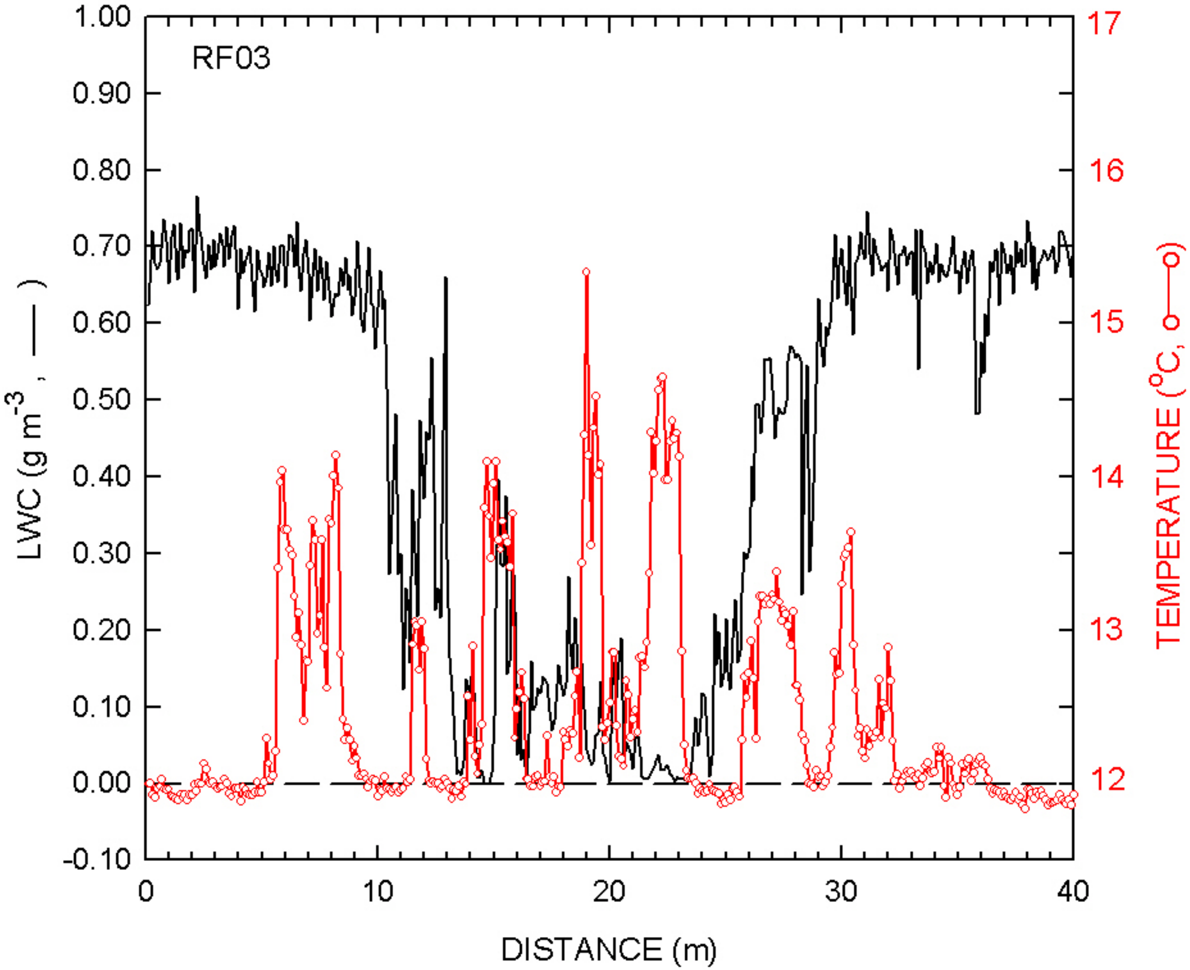


DYCOMS-II Probe Locations



plus aerosol sampling with instruments inside aircraft

UFT - temperature, **1000 Hz**
FFSSP - droplet no. and size, **100 Hz**
PVM - LWC and effective radius, **1000 Hz**


RF03
LWC (g m-3, ——)
TEMPERATURE (°C, —o—)
DISTANCE (m)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
17
16
15
14
13
12
0
10
20
30
40

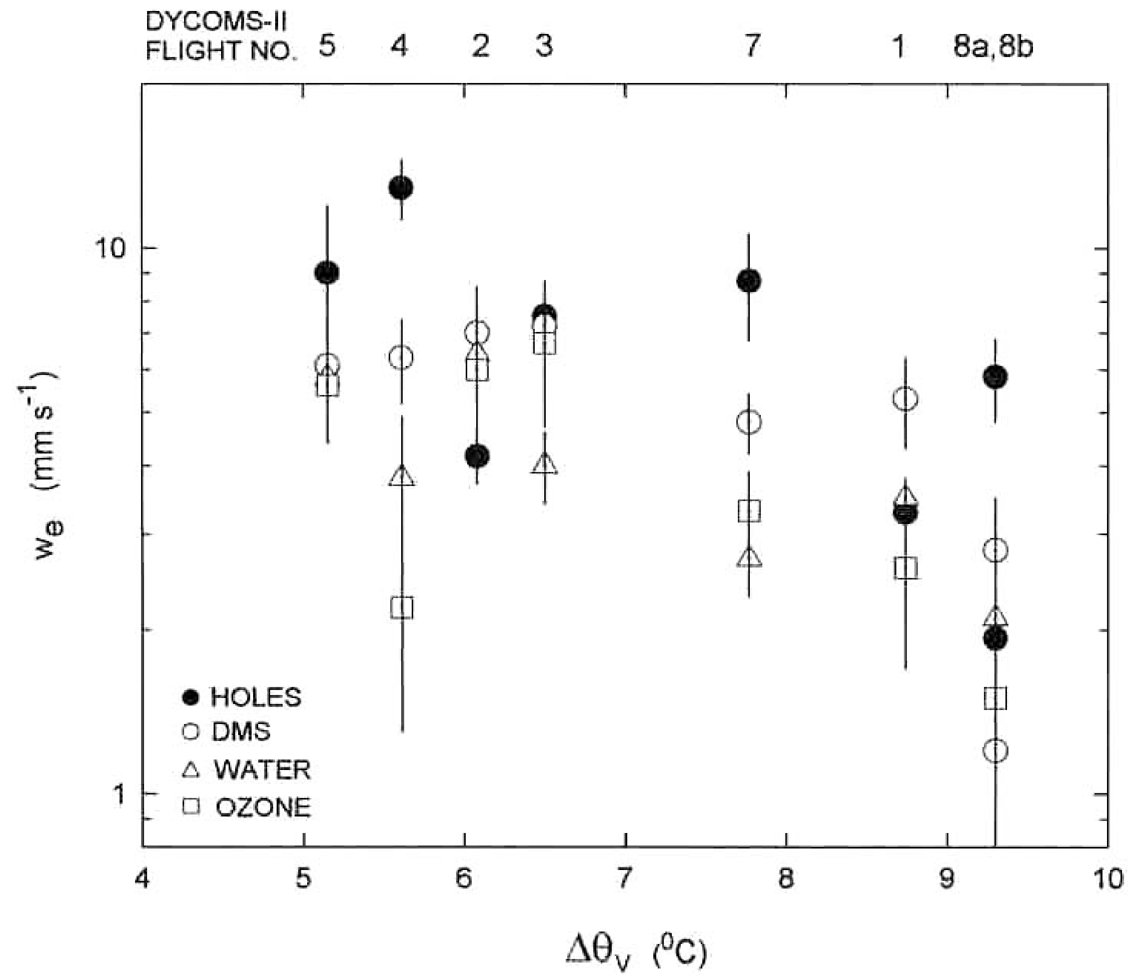
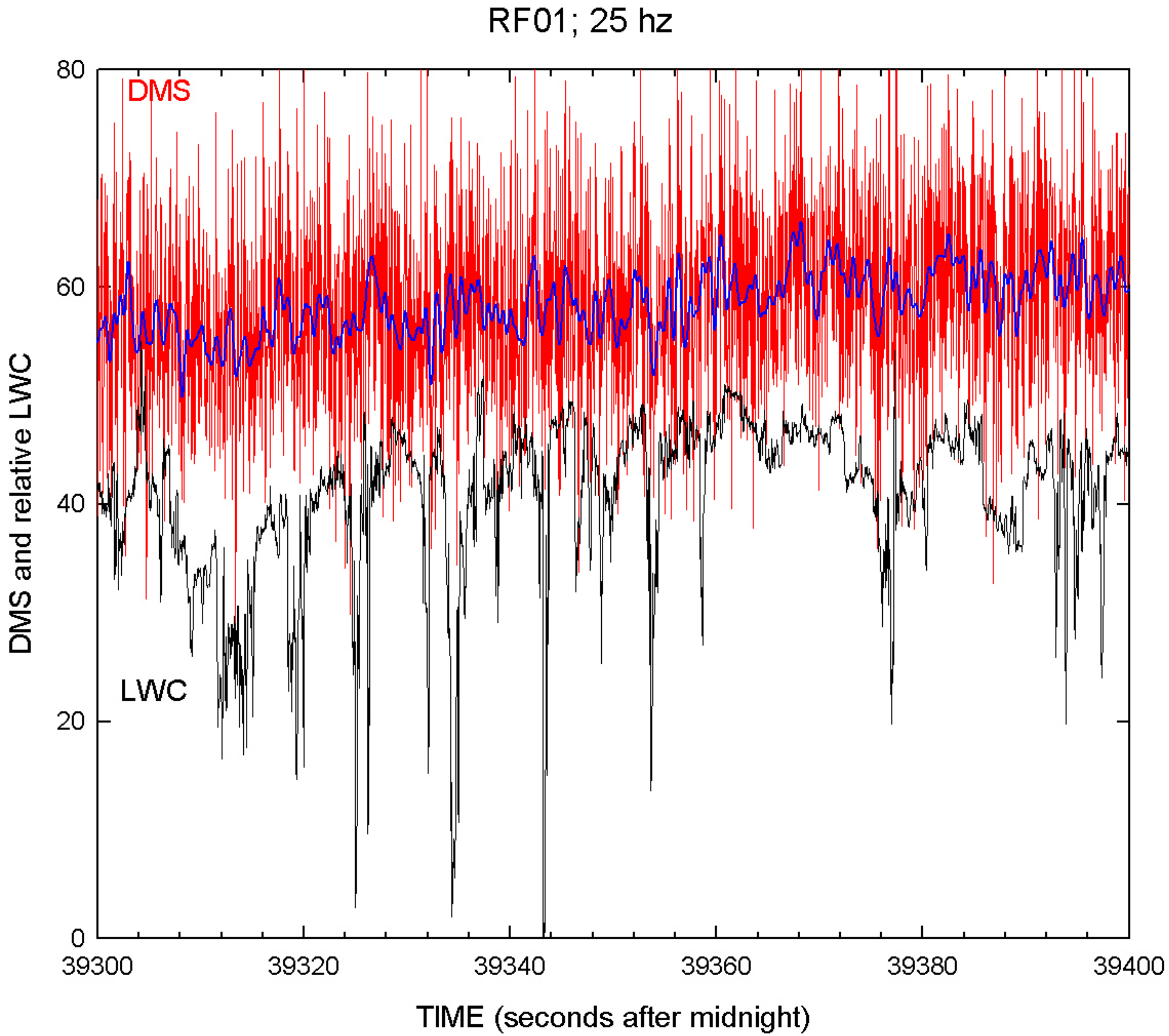
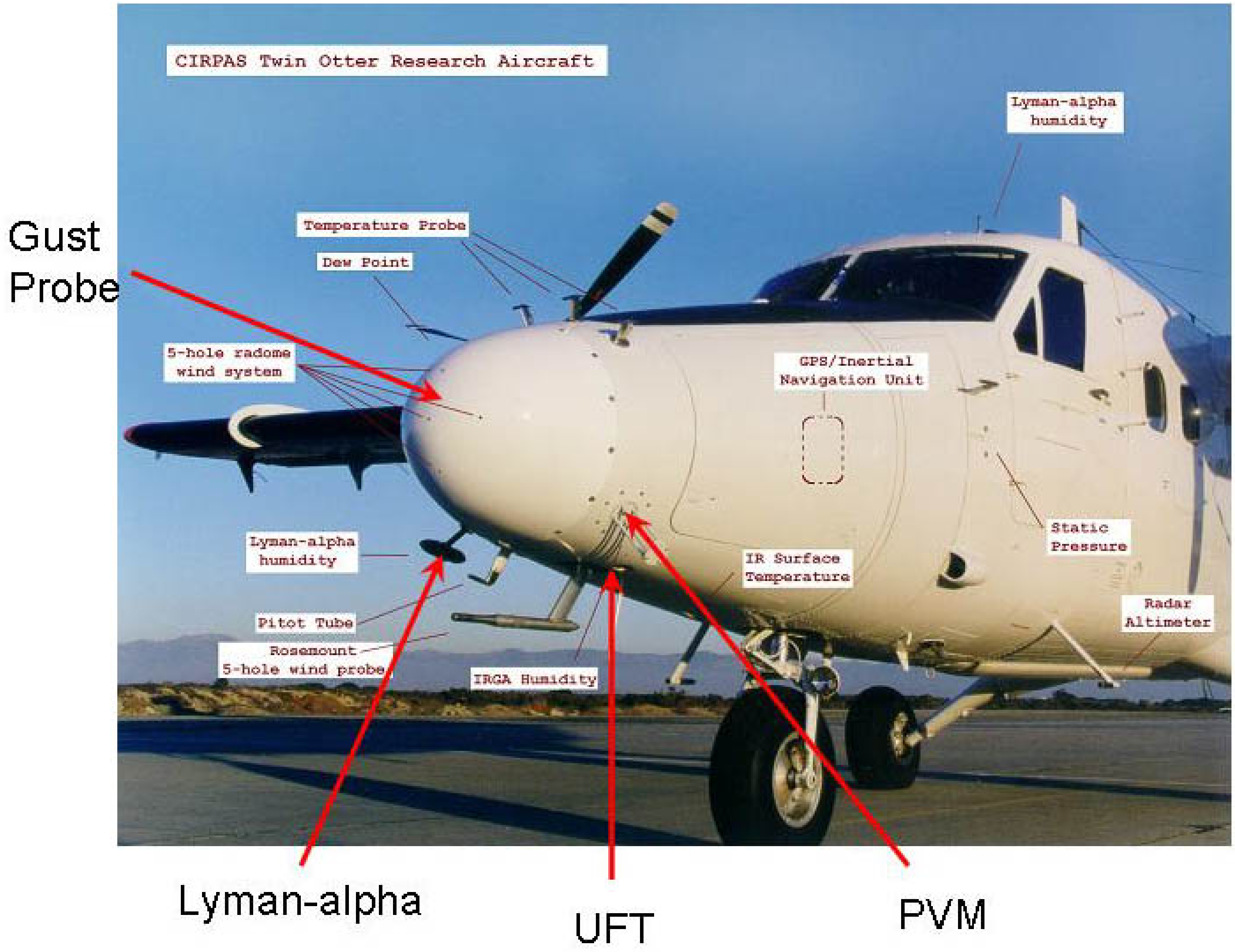


Fig. 1 - Comparison of entrainment velocity (w_e) into Sc measured by four independent measurements on the NCAR C-130 aircraft during DYCOMS-II as a function of the buoyancy jump ($\Delta\theta_v$) at cloud top. The solid data are for conditional sampling of cloud "holes" (Gerber et al., 2005; J.A.S.), and the hollow data are for the the flux-jump method using "DMS", total "water", and "ozone" scalars (Faloona et al., 2005; J.A.S.) The vertical lines through each data are +1/-1 standard deviation.


RF01; 25 hz
DMS
LWC
DMS and relative LWC
0
20
40
60
80
39300
39320
39340
39360
39380
39400
TIME (seconds after midnight)


CIRPAS Twin Otter Research Aircraft
Lyman-alpha humidity
Temperature Probe
Dew Point
5-hole radome wind system
GPS/Inertial Navigation Unit
Static Pressure
IR Surface Temperature
Radar Altimeter
Lyman-alpha humidity
Pitot Tube
Rosemount 5-hole wind probe
IRGA Humidity
Gust Probe
Lyman-alpha
UFT
PVM

Twin-Otter Resolution Improvement

Fluxes (~1m): X 20

Fast Probe Co-Location (~0.5m): X 10

POST July 14-Aug 8, 2008: Payload