RICO WORKSHOP, Jan. 2006

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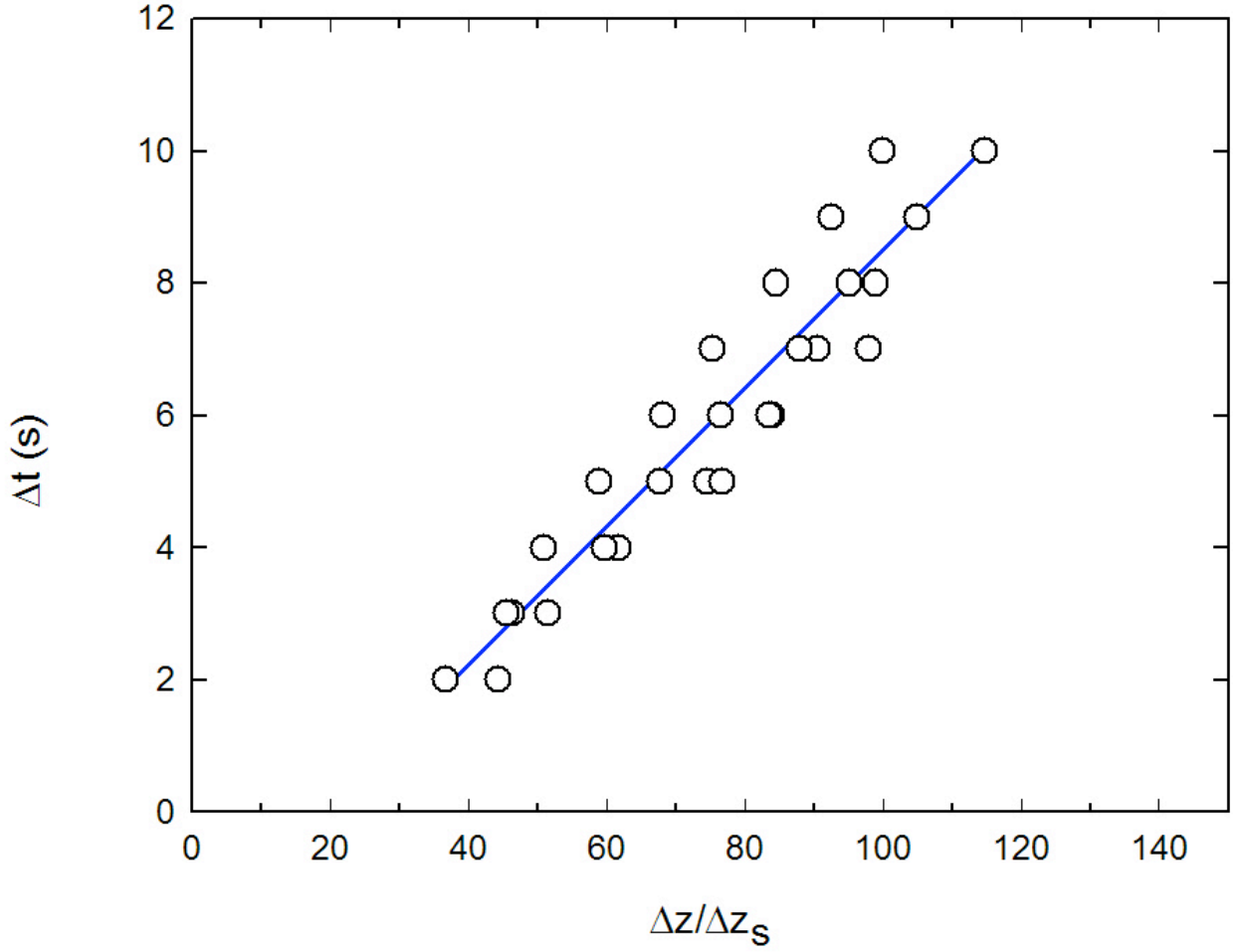


$\Delta z = 50.5\ \Delta z_s\ (\Delta t + 1.97)$ /

X Δz = cloud distance, m

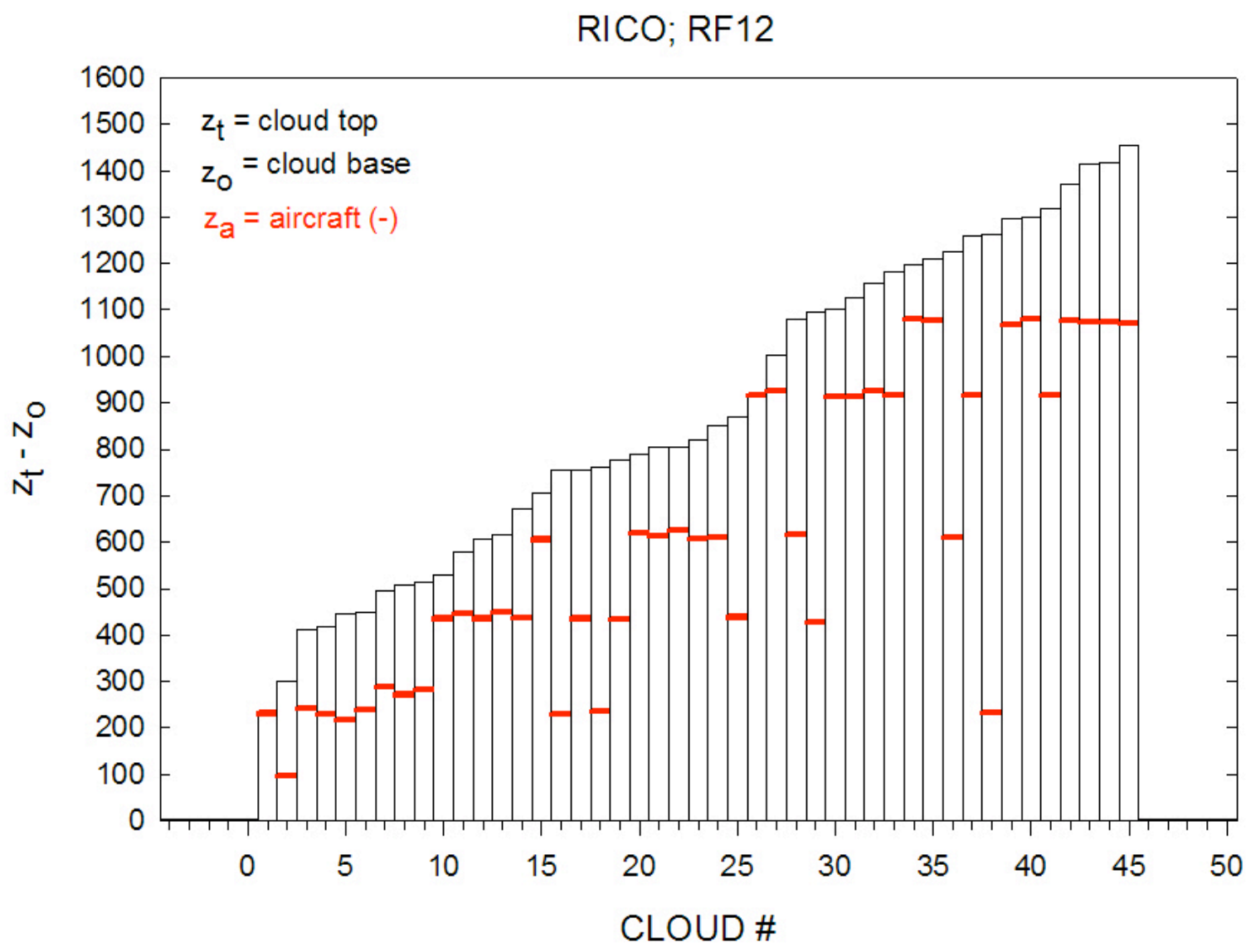
Δz_s = screen distance, cm

Δt = time before cloud intercept, s

X = width of arrow on screen, cm

RICO 135rf12
01/11/2005

UTC	14:03:00
GGLAT	17.1304
GGLON	-61.8032
GGALTC	26
HGM232	-32767
PSXC	1019
PITCH	0
ROLL	0
THDG	055
TASX	4
GGSPD	0
WDC	000
WSC	0
WIC	0.00
ATX	28.5
RHUM	68
XGLWC	-0.00
CONCF_LPC	0.00
CONC2C_LWO	0.00
CONCN	11007
TEO3C	0.0

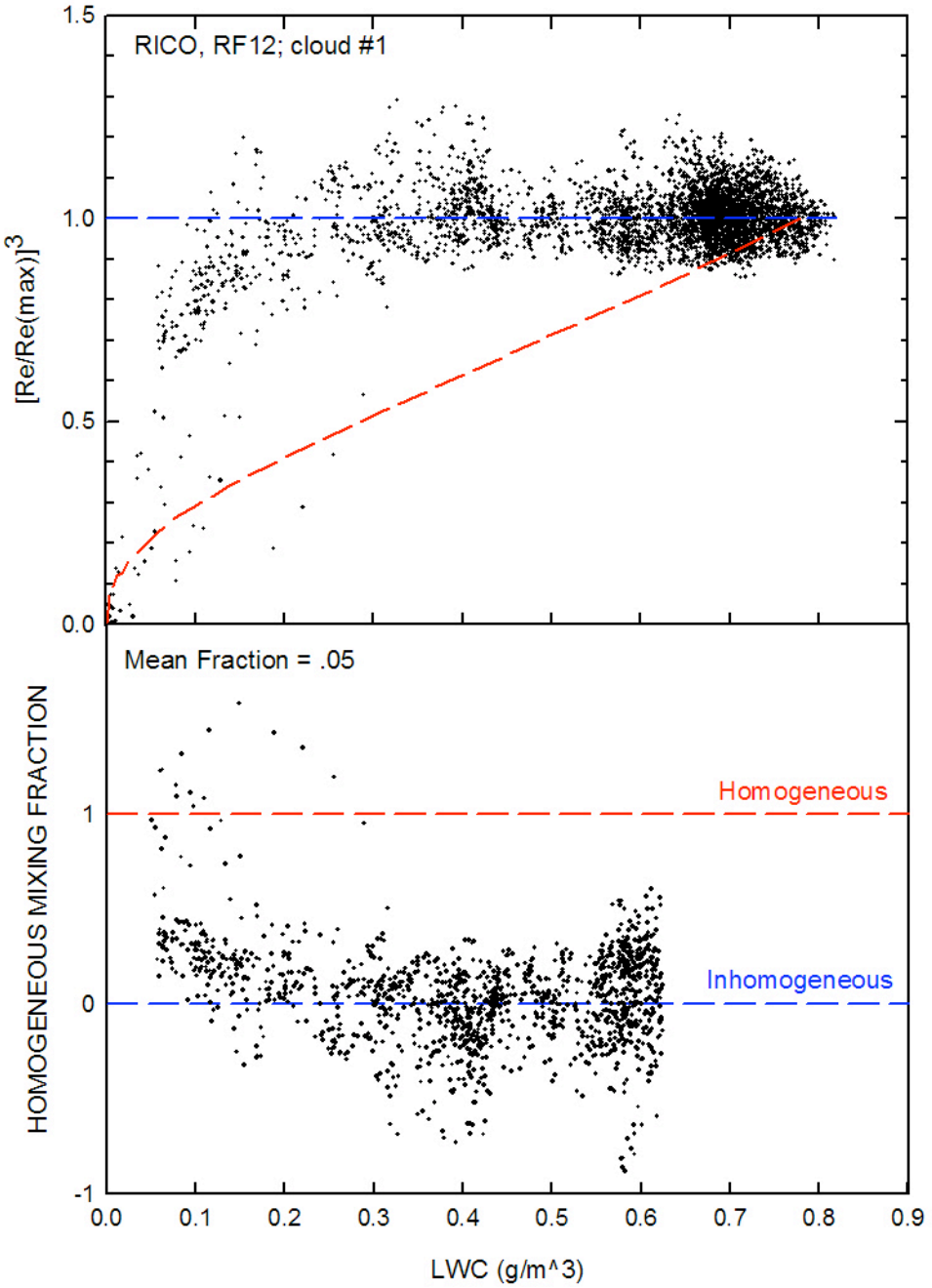

RICO; RF12
z_t = cloud top
z_o = cloud base
z_a = aircraft (-)
$z_t - z_o$
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
35
40
45
50
CLOUD #

USE RF12 AS MICROPHYSICS CASE STUDY – WHY?

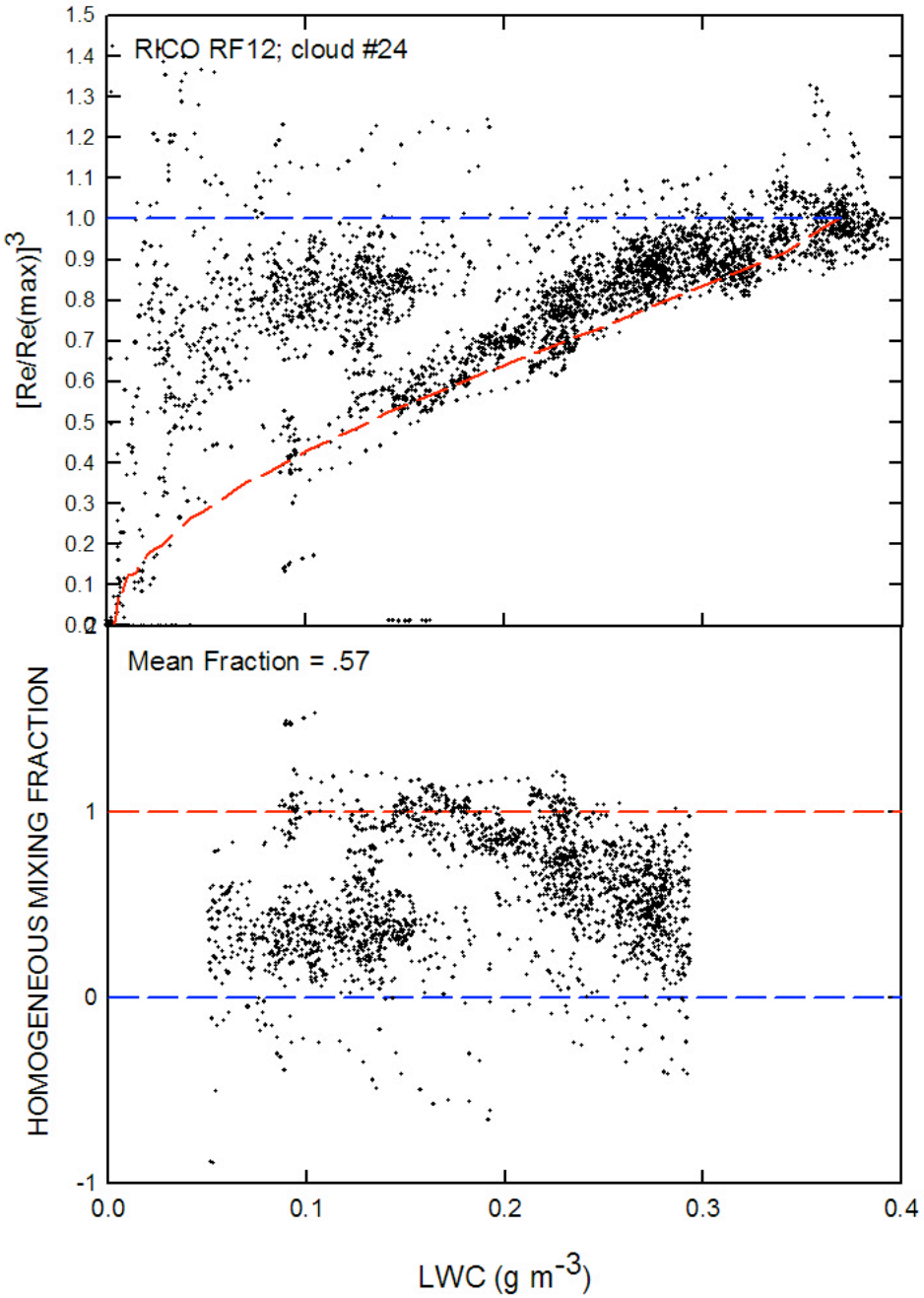
* Cu extend up to ~1500m vertically
* Five flight levels with adequate amount of data
* Moderate droplet concentration, ~125 cm^{-3}
* Drizzle/precipitation is not excessive
* Most C-130 aircraft probes functional
* Agreement between LWC measured by three probes
* Some shear in wind speed

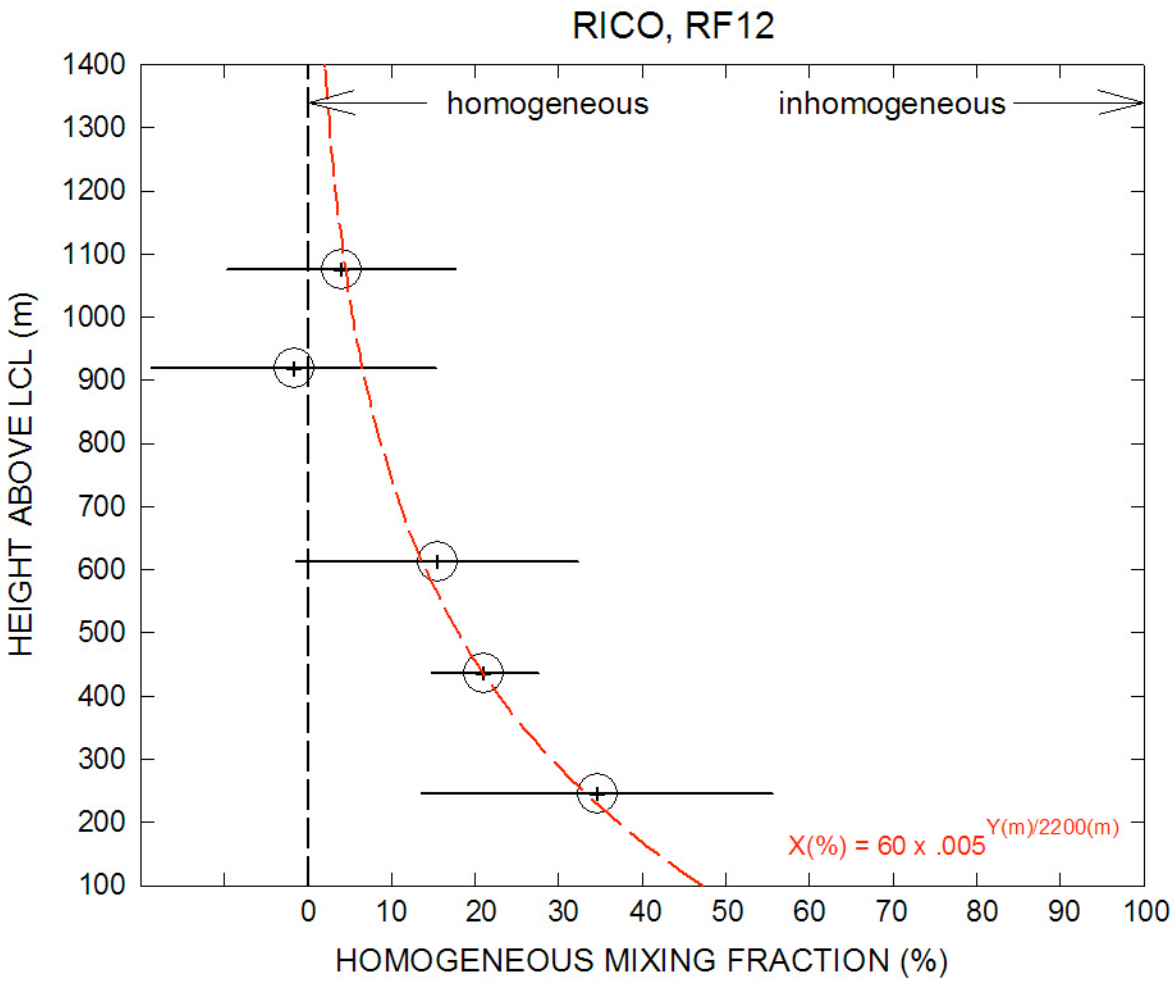
PVM

LWC ~ 4/3 Rho pi N r_e^3



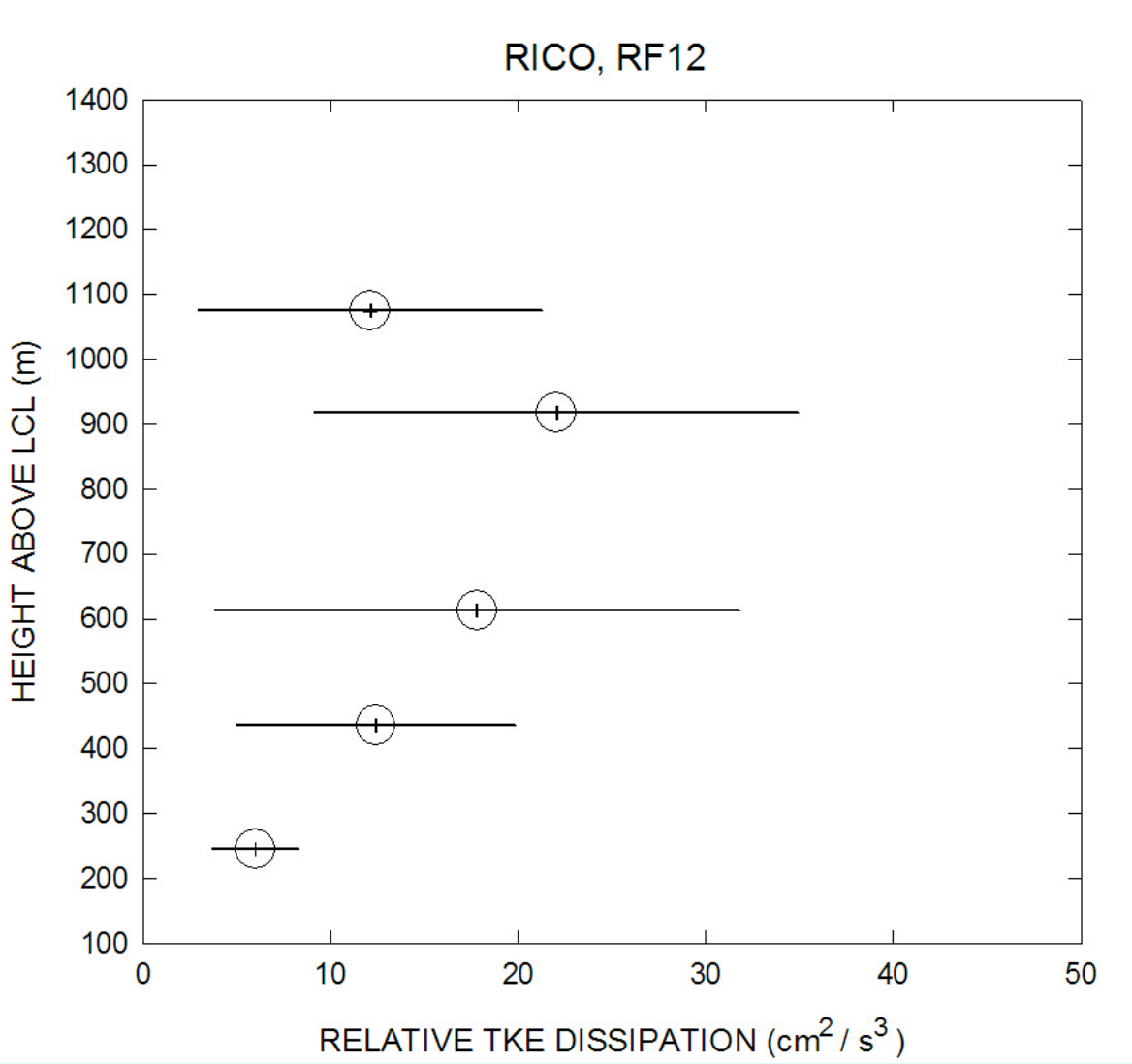
(Gerber, H., et al., 2001: Spectral density of cloud liquid water content at high frequencies. J. Atmos. Sci., 58, 497–503.)


RICO RF12; cloud #24
[Re/Re(max)]^3
Mean Fraction = .57
HOMOGENEOUS MIXING FRACTION
LWC (g m^-3)
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1
0
-1
0.0
0.1
0.2
0.3
0.4

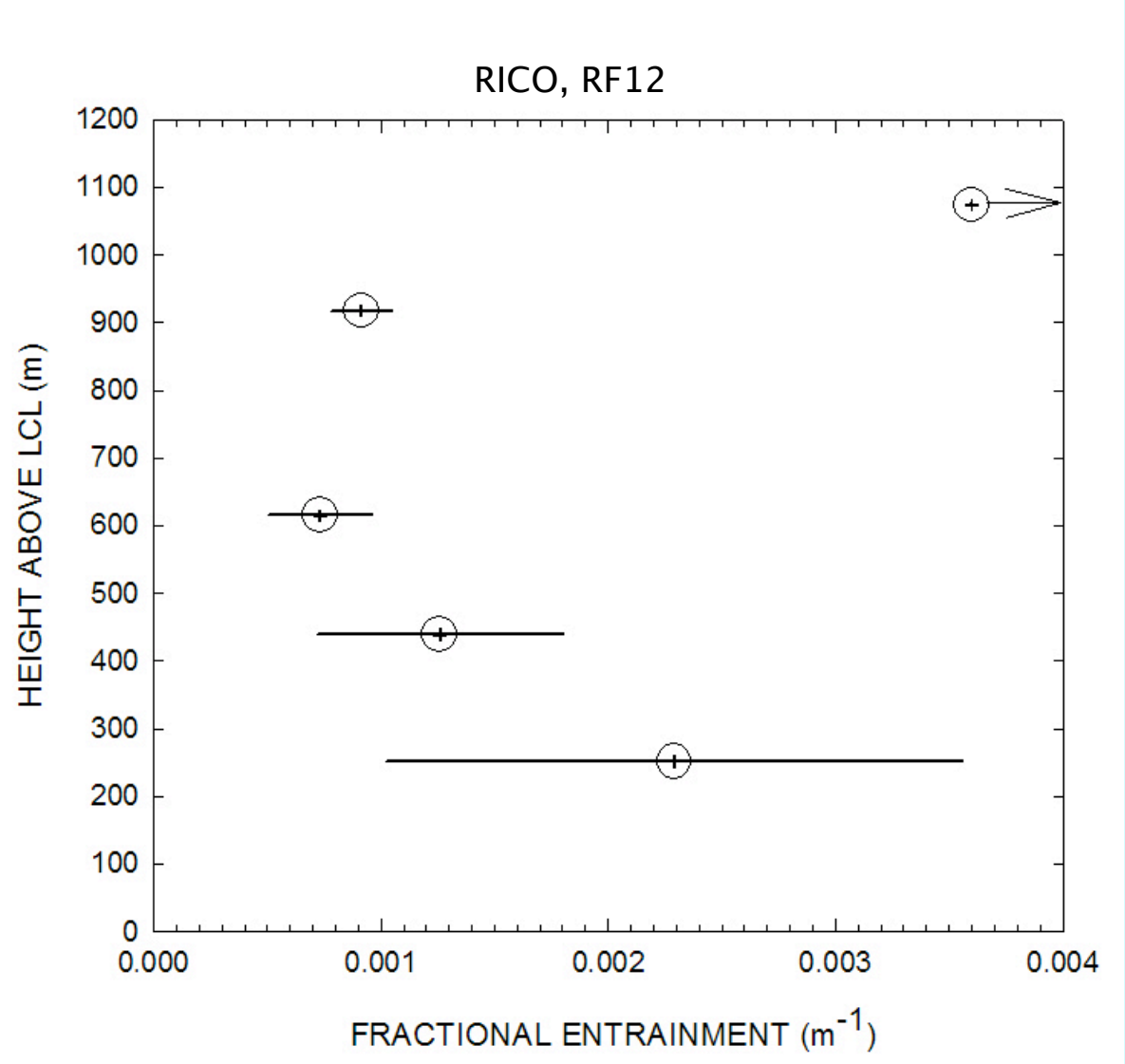


(Gerber, H., et al., 2006: Entrainment, mixing, and
microphysics in RICO cumulus. AMS Cloud Physics Conf.)

TKE DISSIPATION RATE



FRACTIONAL ENTRAINMENT



FOOD FOR THOUGHT

- ☆ INHOMOGENEOUS MIXING DOMINATES AT ALL CLOUD LEVELS
- ☆ HOMOGENEOUS MIXING FRACTION INCREASES DOWNWARD TO CLOUD BASE
- ☆ ENTRAINMENT OF PRE-MOISTENED AIR NEAR CLOUD BASE CAUSES INCREASE IN HOMOGENEOUS MIXING FRACTION
- ☆ SPECTRAL BROADENING IS CAUSED BY HOMOGENEOUS MIXING NEAR CLOUD BASE, BY ACTIVATION OF NEW CCN AT ALL LEVELS, AND BY .....
- ☆ RE-ASSESS RELATIONSHIP OF TKE AND DROPLET TIME CONSTANTS: LONG TKE CONSTANT DOES NOT MEAN INHOMOGENOUS MIXING
- ☆ RE-ASSESS ENTRAINMENT BY "LARGE" BLOBS: LWC-FREE VOIDS INCLOUD ARE RARE THUS BLOBS ARE MOSTLY SMALL

RICO C-130 INSTRUMENTATION / DATA

1. INCLOUD TEMPERATURE INADEQUATE: ROSEMONT GIVES DECREASED READINGS, OPHIR IS TOO SLOW
2. DESIRE HIGHER SPEED GUST PROBE MEASUREMENTS CLOSER TO CLOUD PROBES
3. CONSIDER MAKING "HRT" DATA A MULTIPLE OF 10-HZ DATA
4. VIDEO AND MICROPHYSICS 1-s OUT OF SYNC
5. PVM 1000-HZ DATA SHOWS PICKUP (SPIKES), BUT IS GENERALLY USABLE
6. CIN DATA MAY BE QUESTIONABLE – MORE ANALYSIS NEEDED
7. NICE JOB RAF!