Fast-FSSP Measurements

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METEO FRANCE

RiCO
Rain In Cumulus over the Ocean

Fast processing perpectives:

- Release of the preliminary data set in september.

=> done

- Investigate the size dependence of the sampling section at the laboratory to establish a correction procedure.

=> Sdof measurements with holes

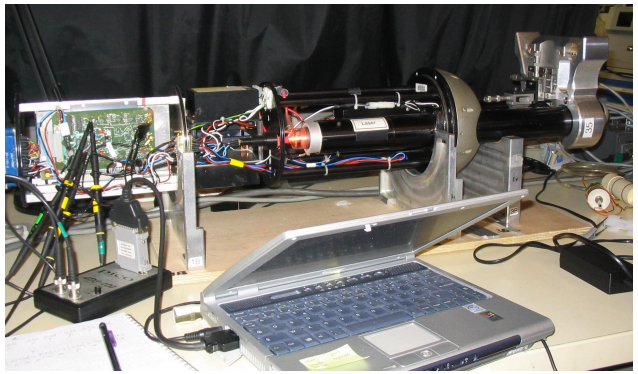
- Take into account the loss of sensibility due to the salt accumulation on the probe optics.

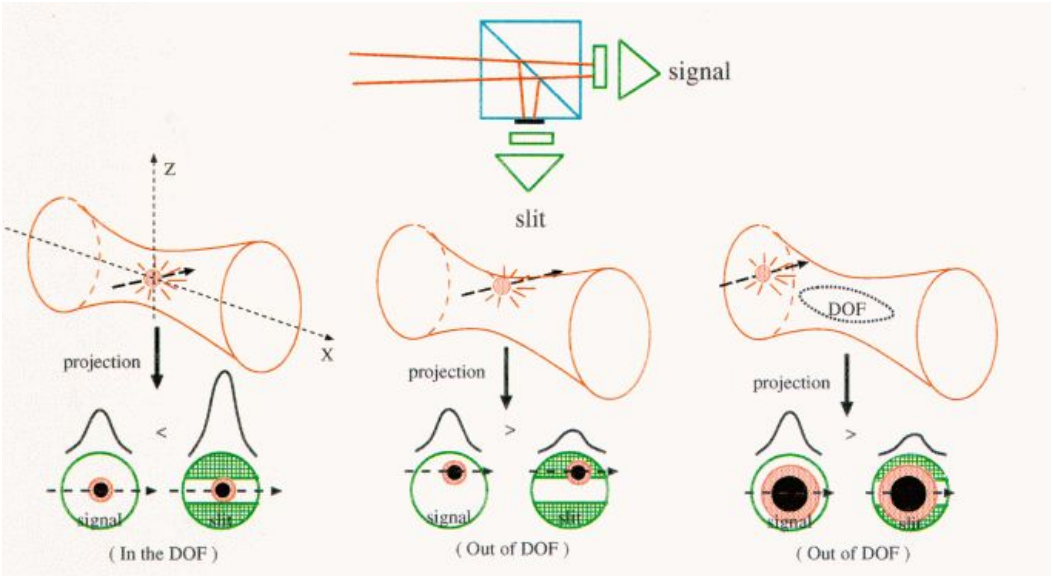
=> in progess: tests with the self-calibration technique

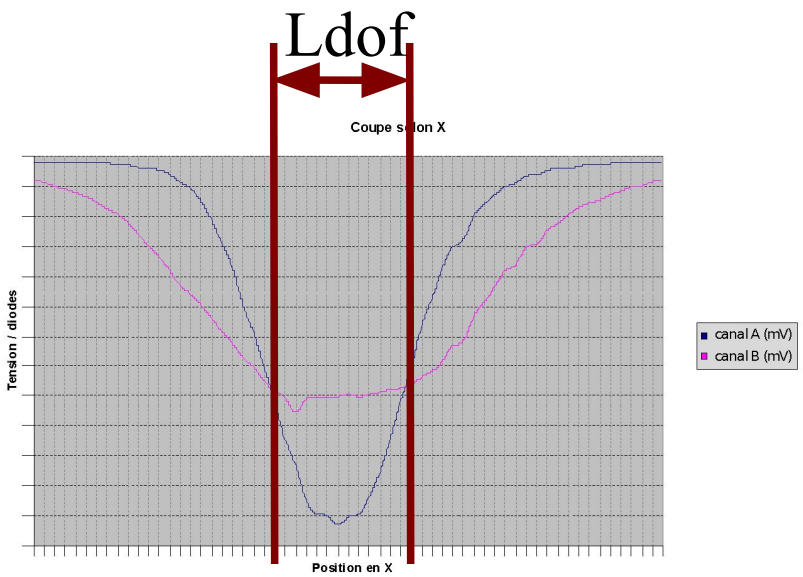
- A main limitation comes from the poor statistics due to very low CDNC values: use of the optimal estimator of Pawlowska et al.

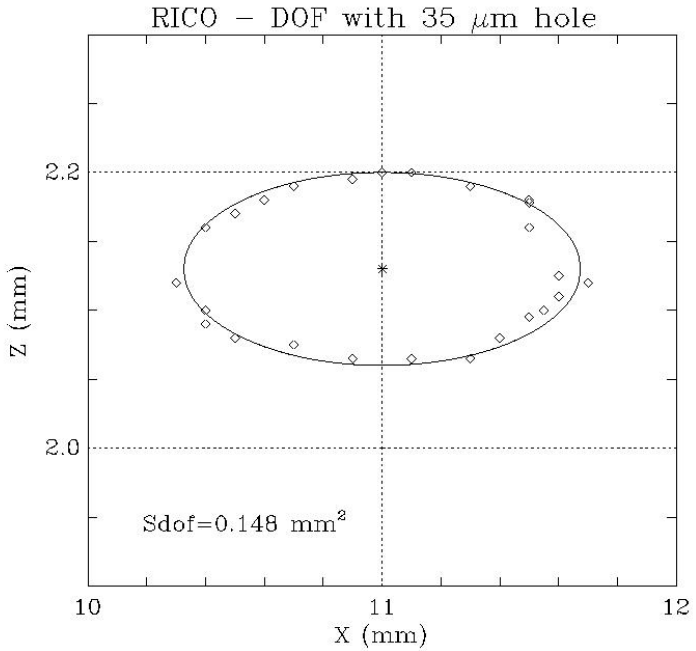
=> in progess: Hanna's student

Sdof measurements with holes

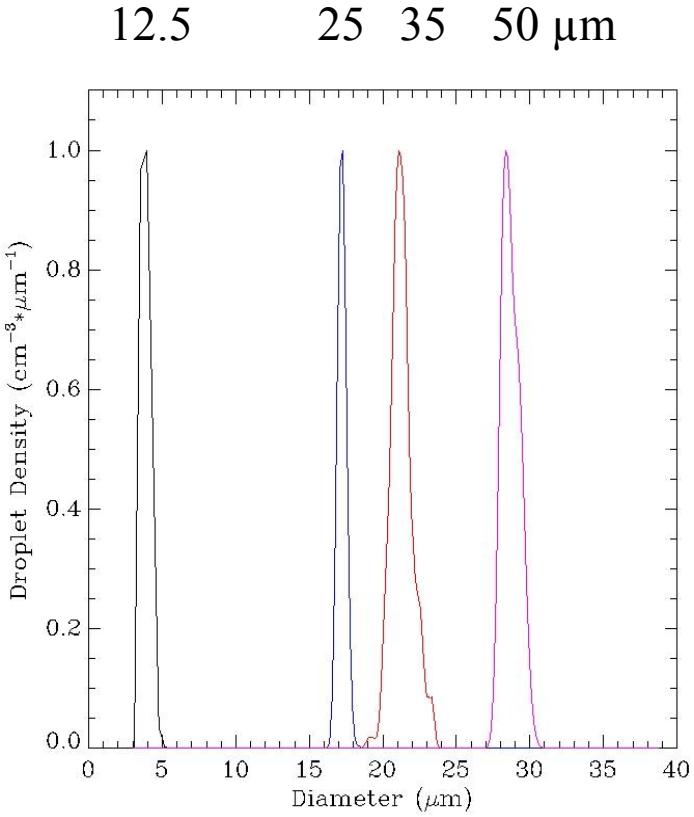


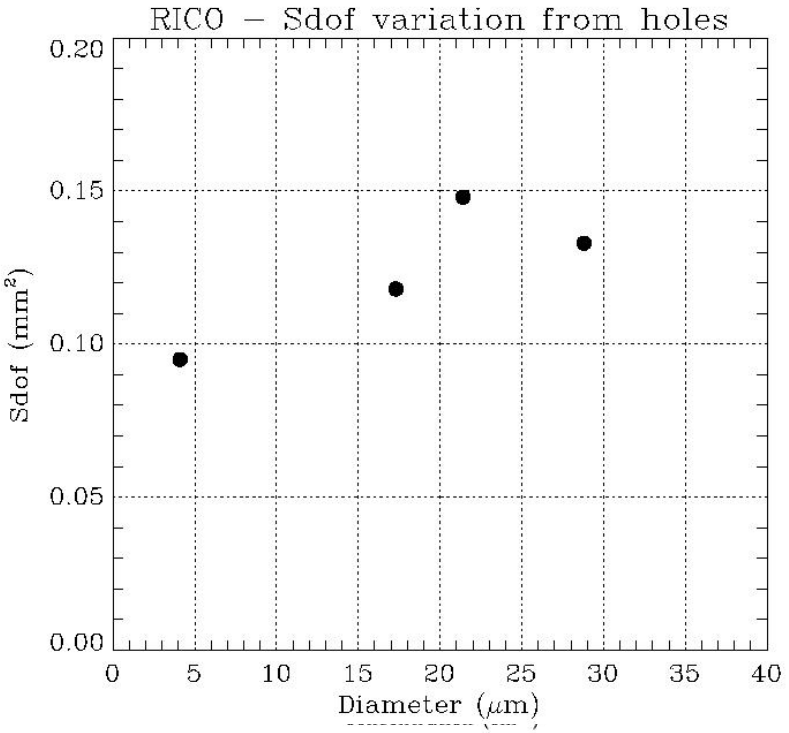


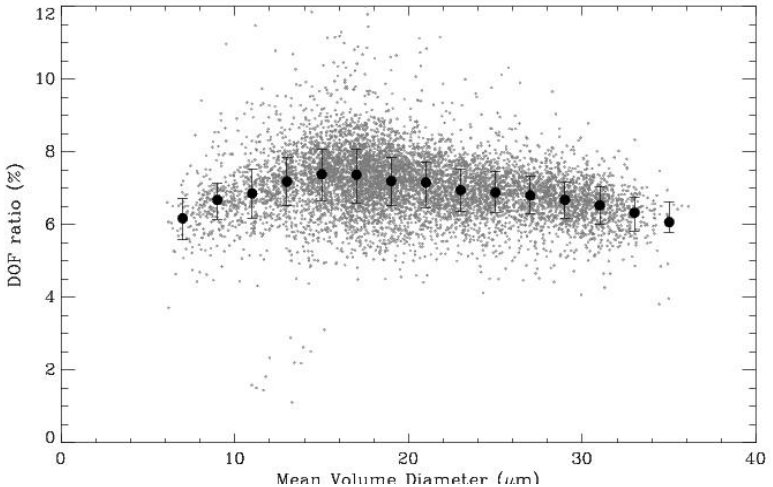


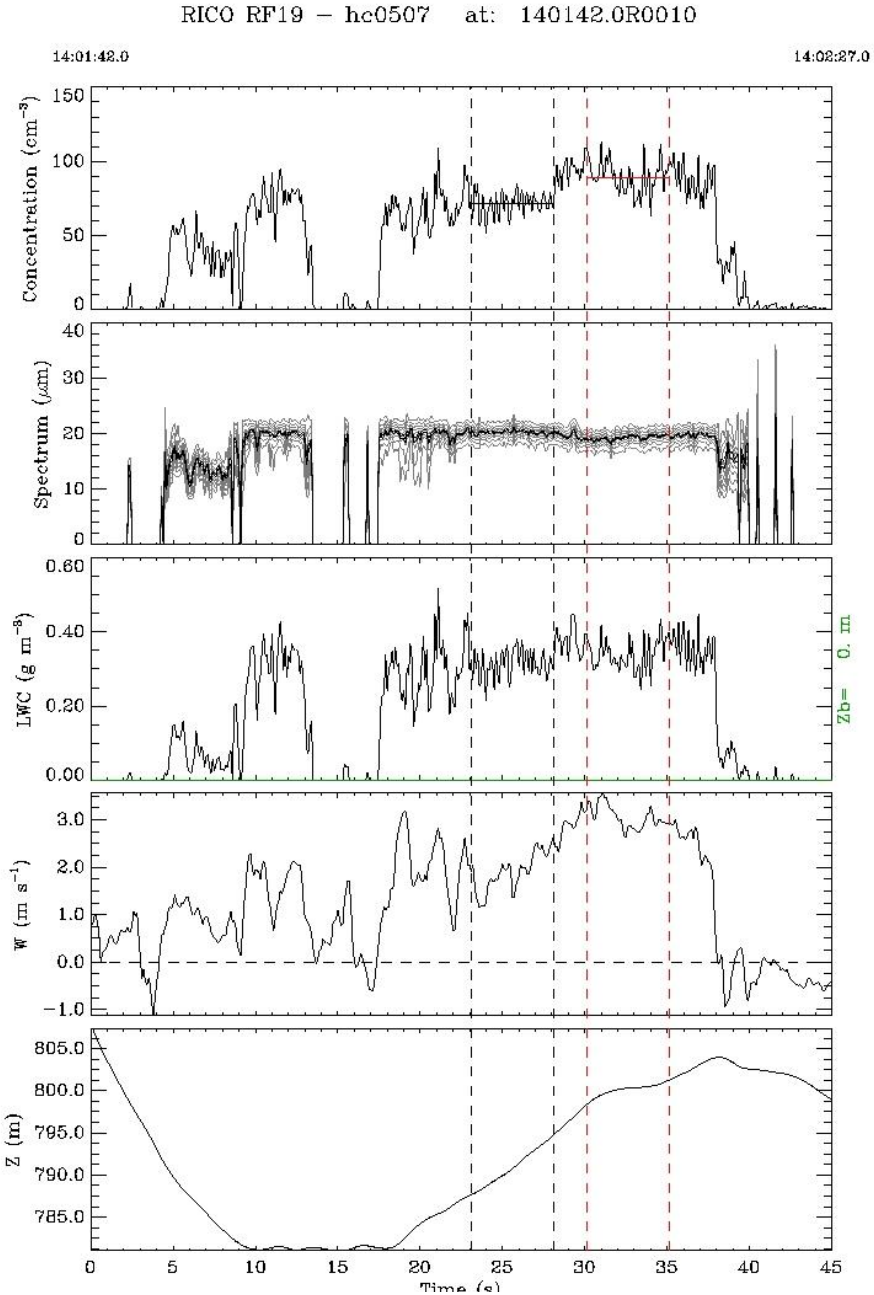


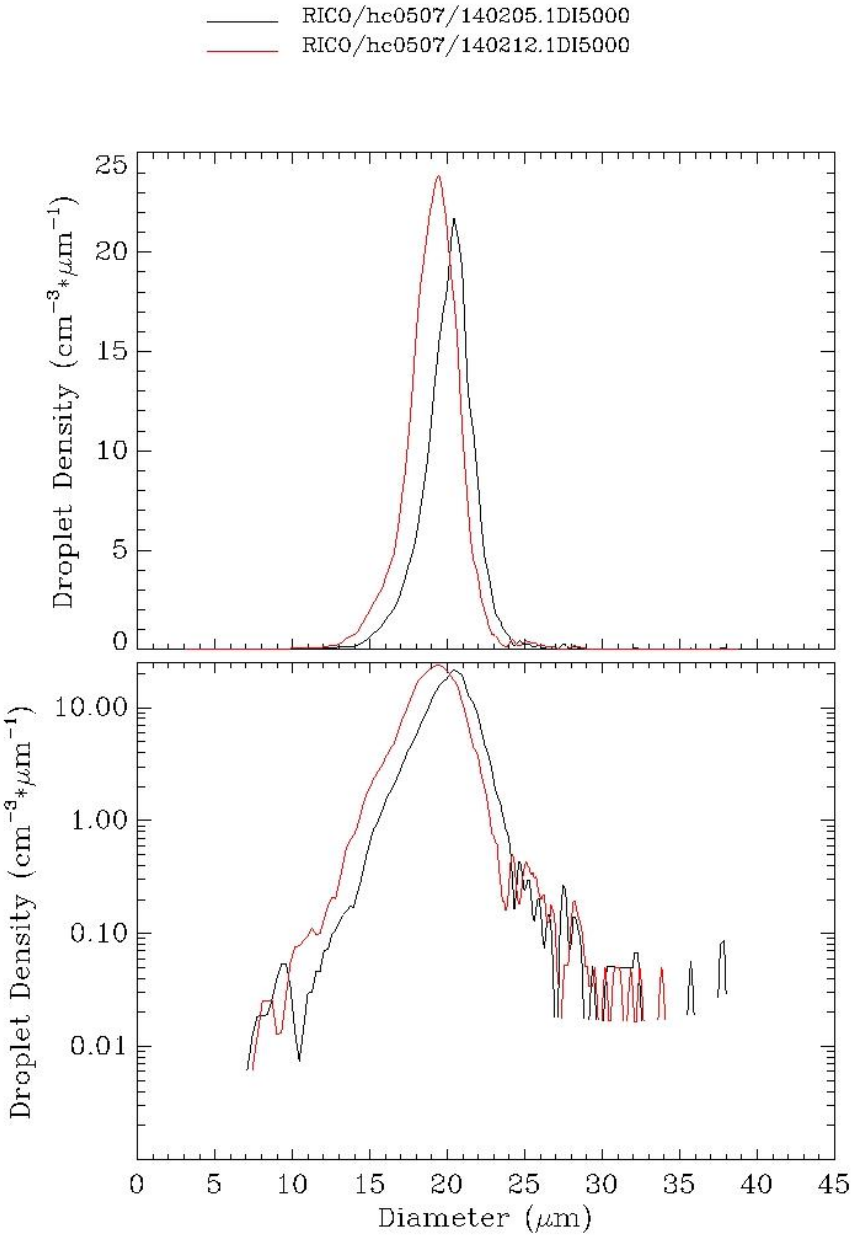
Sdof variations with hole size:

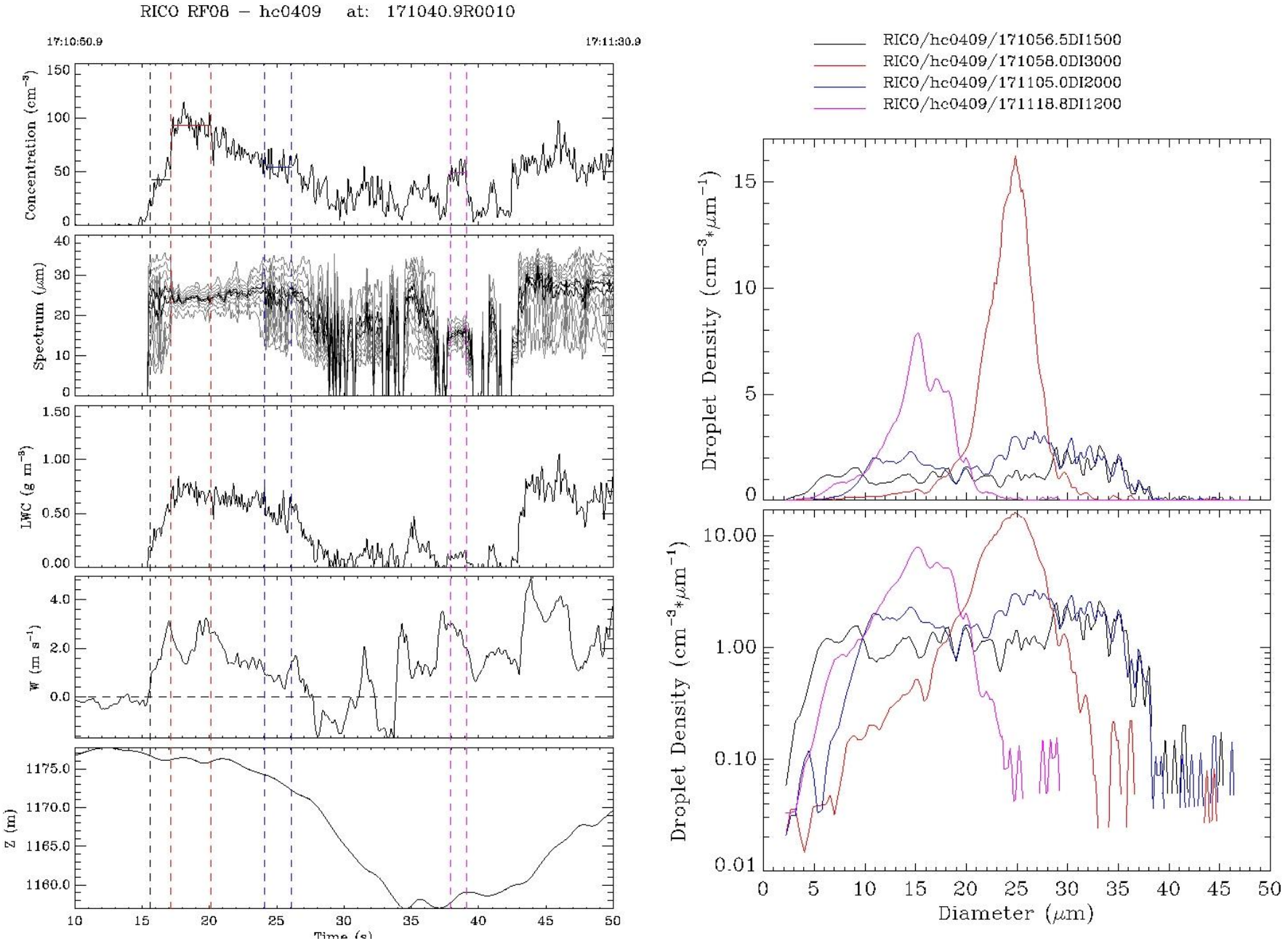




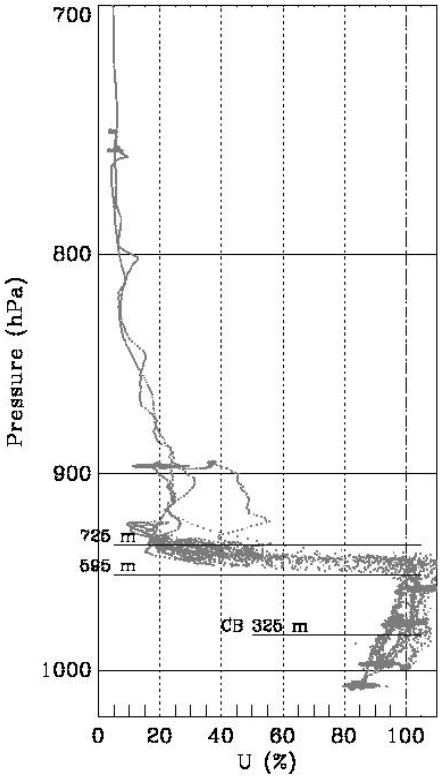



RICO RF19 – hc0507 at: 140142.0R0010
14:01:42.0
14:02:27.0
Concentration (cm^{-3})
Spectrum (μm)
LWC (g m^{-3})
Zb= 0. m
W (m s^{-1})
Z (m)
Time (s)

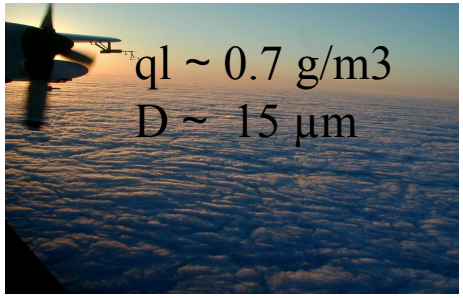

RICO/hc0507/140205.1DI5000
RICO/hc0507/140212.1DI5000
Droplet Density (cm^{-3}*μm^{-1})
Droplet Density (cm^{-3}*μm^{-1})
Diameter (μm)


RICO RF08 – hc0409 at: 171040.9R0010
17:10:50.9
17:11:30.9
Concentration (cm⁻³)
Spectrum (μm)
LWC (g m⁻³)
W (m s⁻¹)
Z (m)
Time (s)
RICO/hc0409/171056.5DI1500
RICO/hc0409/171058.0DI3000
RICO/hc0409/171105.0DI2000
RICO/hc0409/171118.8DI1200
Droplet Density (cm⁻³*μm⁻¹)
Diameter (μm)

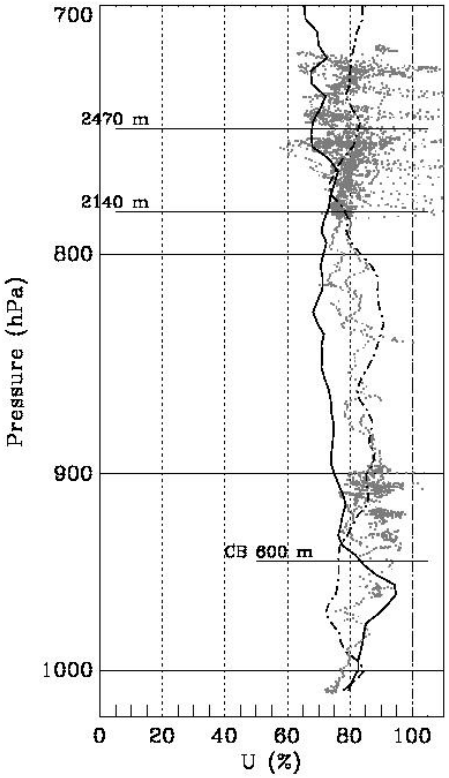
DYCOMS-II RF03



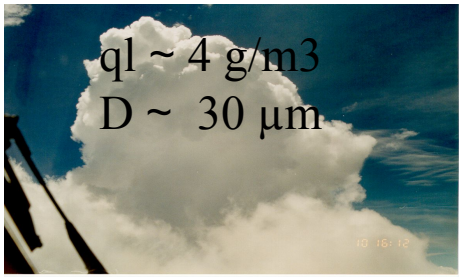
RH ~ 80 %
w ~ 0.3 m/s



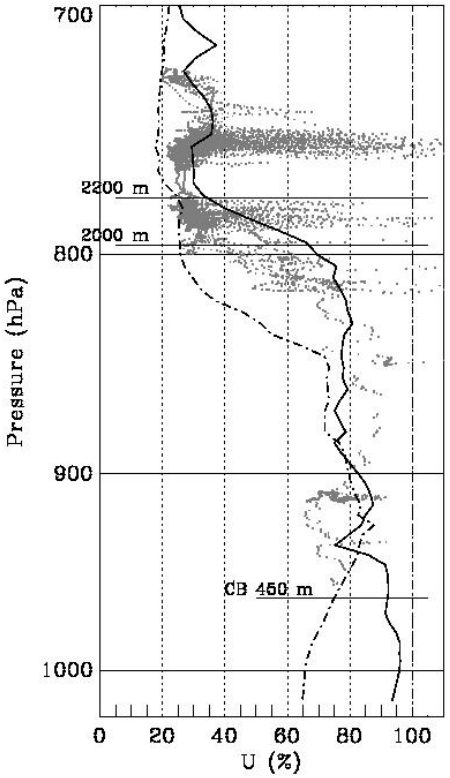
SCMS-10/08



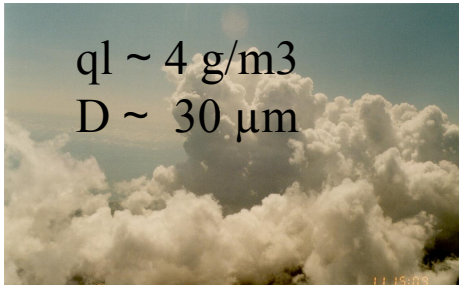
RH ~ 80 %
w ~ 6 m/s



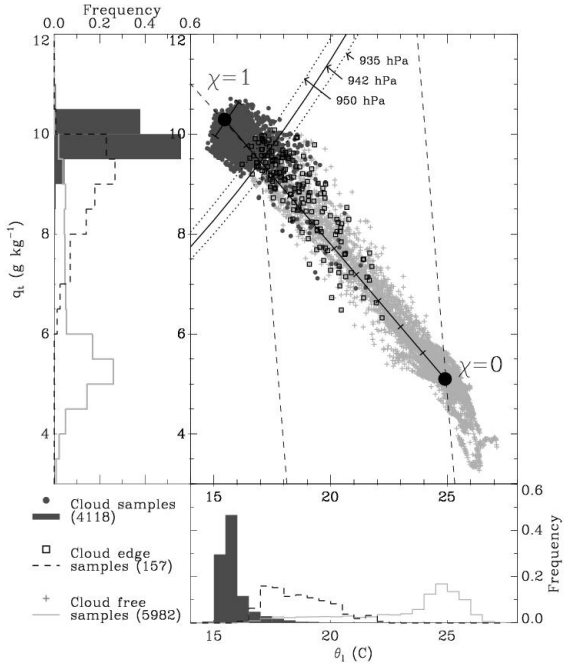
SCMS-05/08

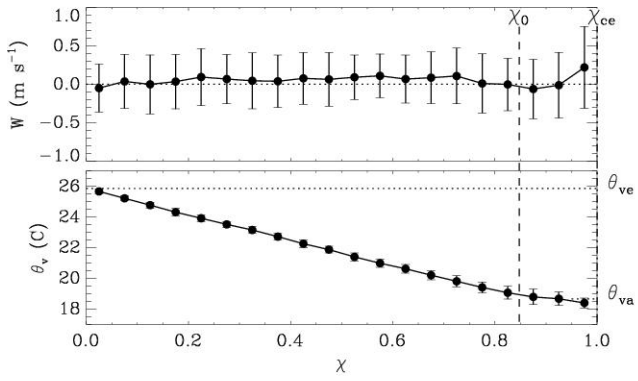


RH ~ 30 %
w ~ 6 m/s

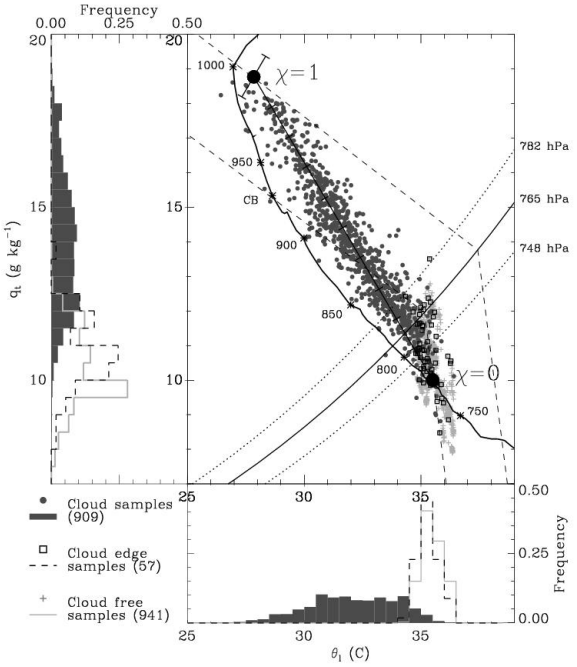


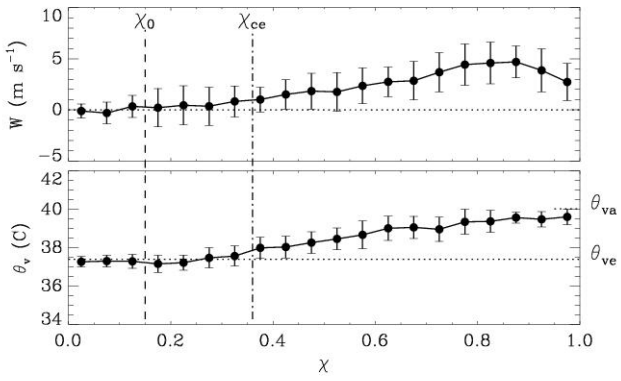
DYCOMS-II RF03





SCMS-10/08





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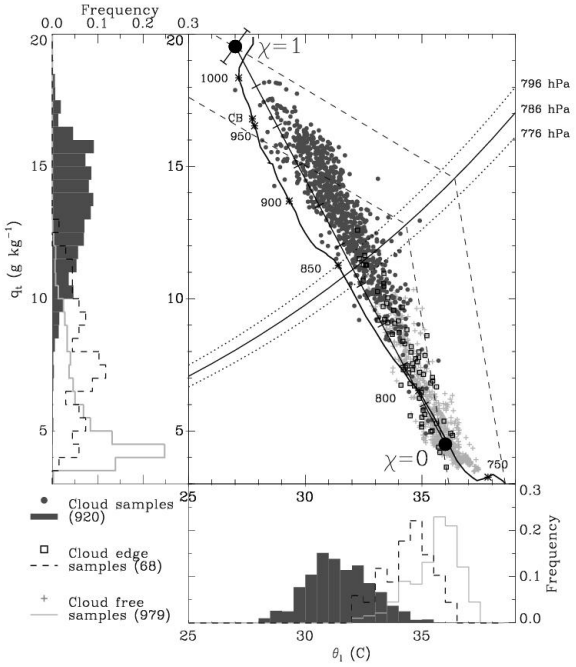
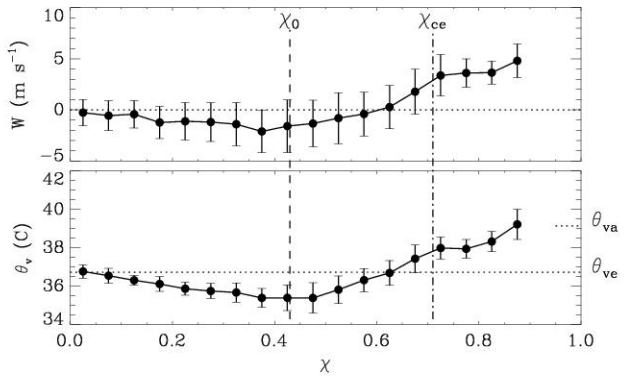




=> use of the simplified isobaric mixing model

Baker et al. conceptual model

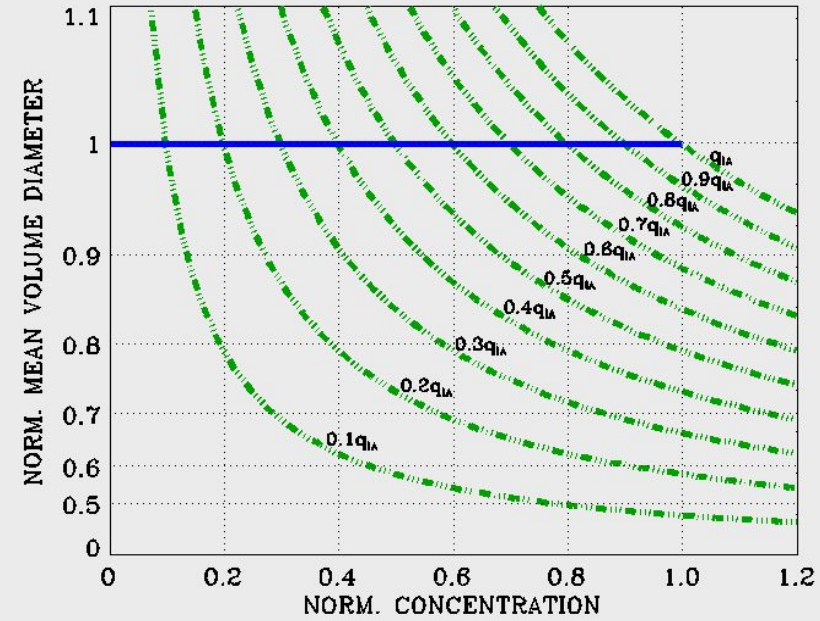
Key Parameters: droplet life time $\tau_d = -(\varphi^2/AS)$ **turbulent homogenization** $\tau_T = (L^2/\varepsilon)^{1/3} = L/W$

Inhomogeneous

$\tau_t >> \tau_d$

N ↘ dilution + evaporation

Φv constant



$\frac{\Phi_V^3}{\Phi_{VO}^3}$

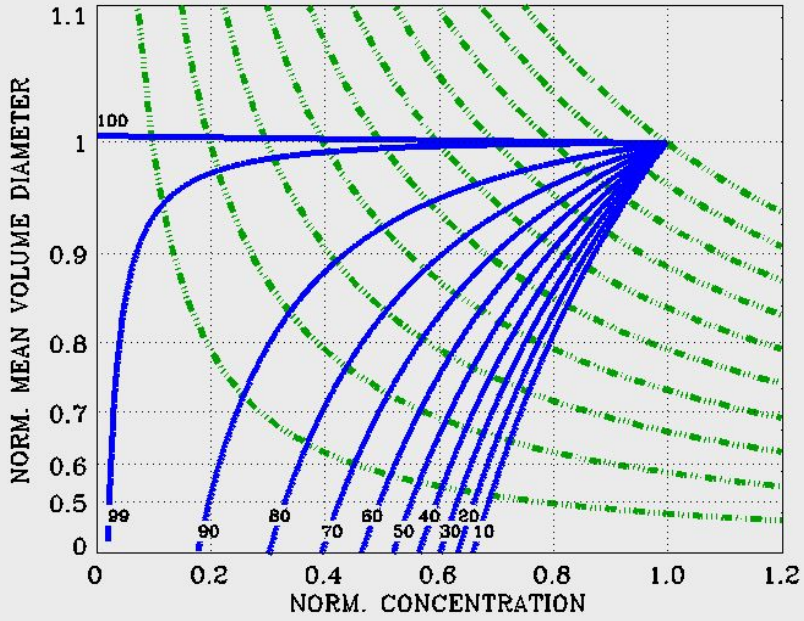
N / No

Homogeneous

$\tau_t << \tau_d$

N ↘ dilution only

Φv ↘ evaporation



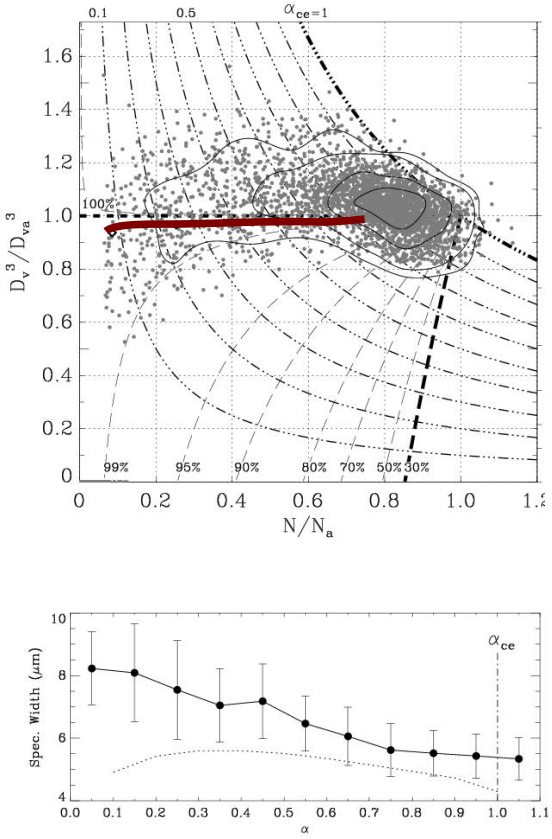
N / No

DYCOMS-II RF03

$\tau_t \sim 1.7$ s

$\tau_d \sim 0.8$ s

$\tau_d / \tau_t \sim 0.05$

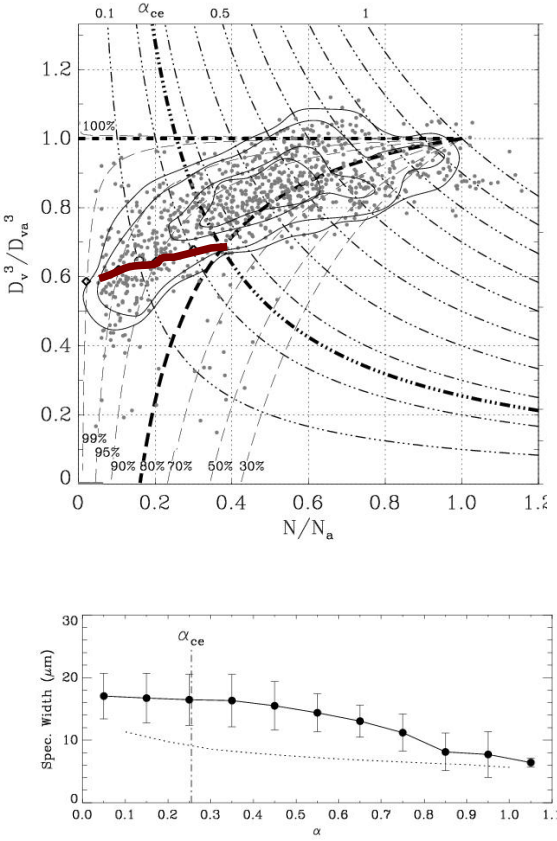


SCMS-11/08

$\tau_t \sim 17$ s

$\tau_d \sim 11.3$ s

$\tau_d / \tau_t \sim 6.6$

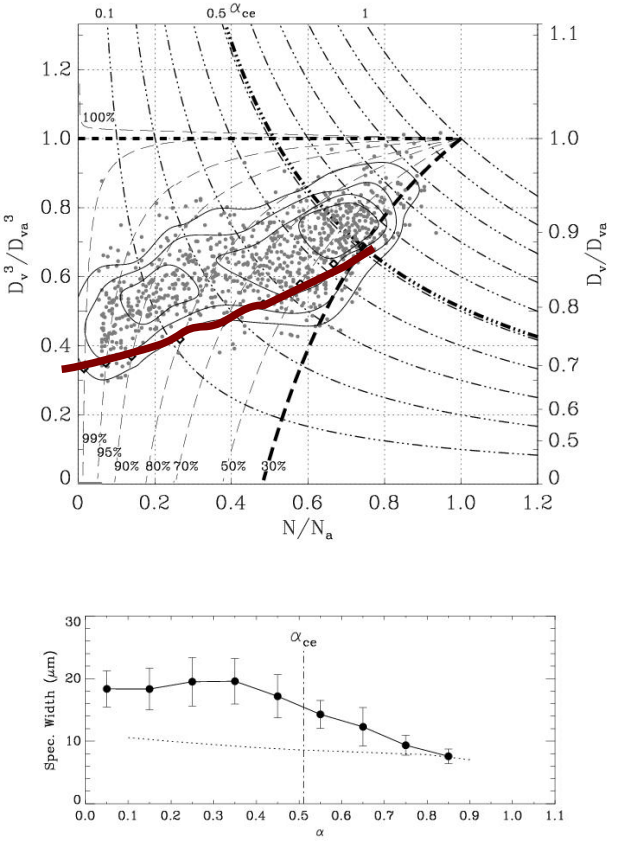


SCMS-06/08

$\tau_t \sim 17$ s

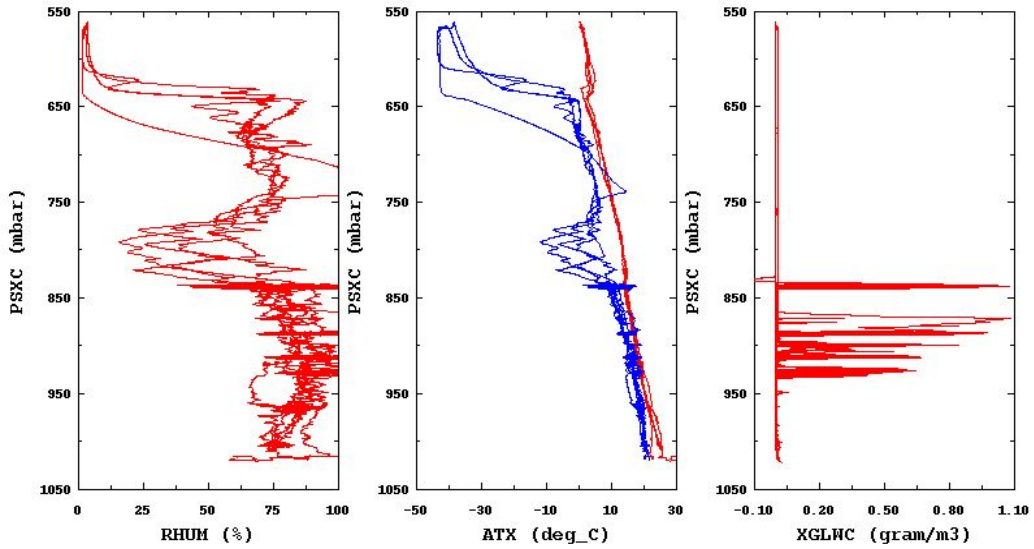
$\tau_d \sim 3.2$ s

$\tau_d / \tau_t \sim 1.9$



What about RICO ?

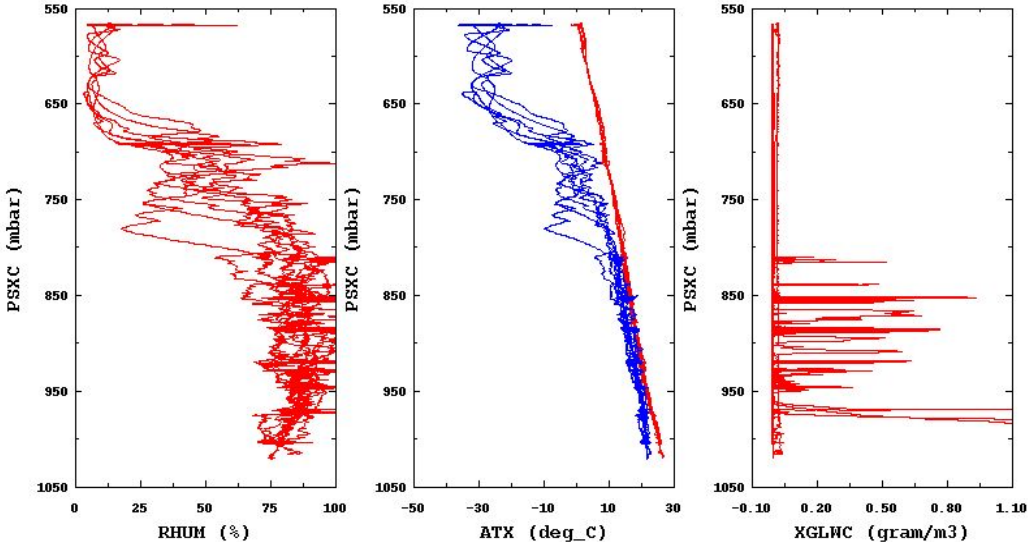
RICO RF08



RH ~ 80 %
D ~ 20 µm => τ_d ~ 5.5 s

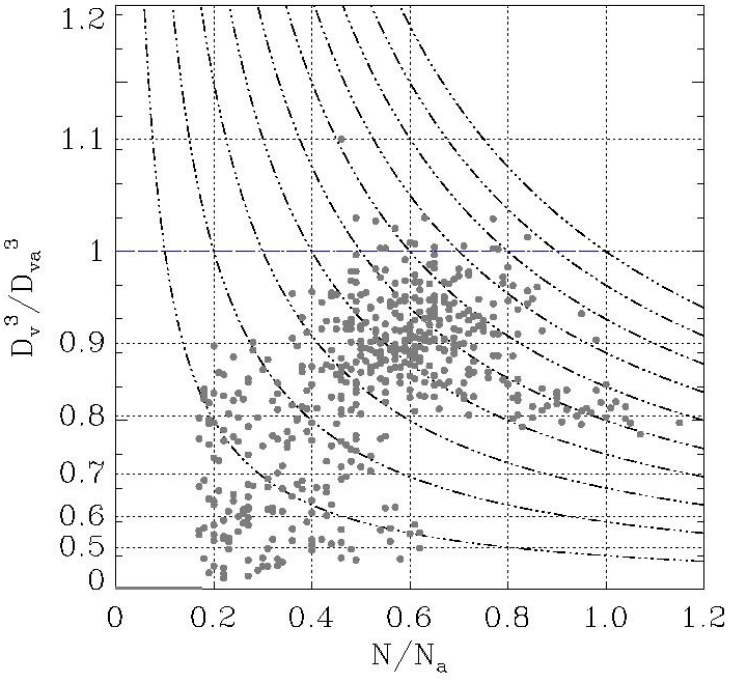
w ~ 3 m/s => τ_t ~ 8 s

RICO RF19

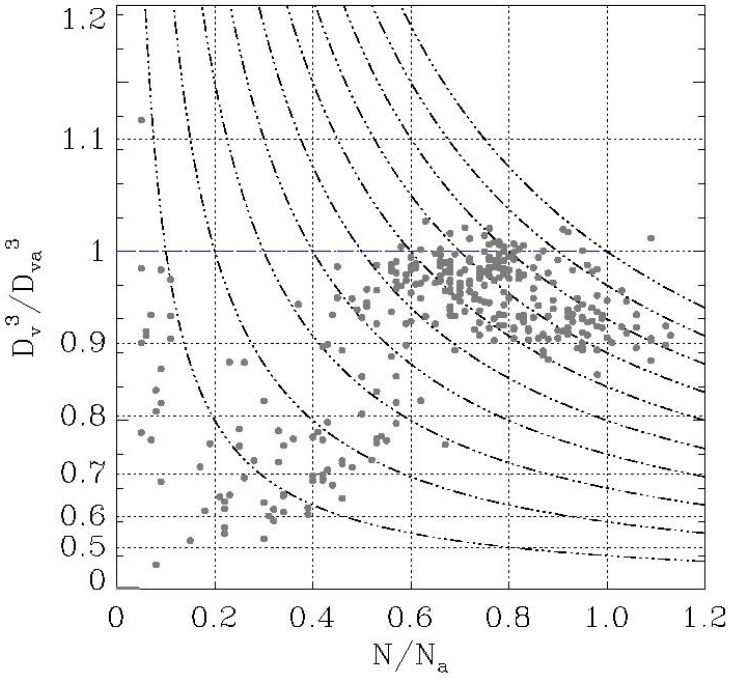


τ_t / τ_d ~ 1.5
0.05 << intermediate << 6.6
value !

RICO RF08



RICO RF19

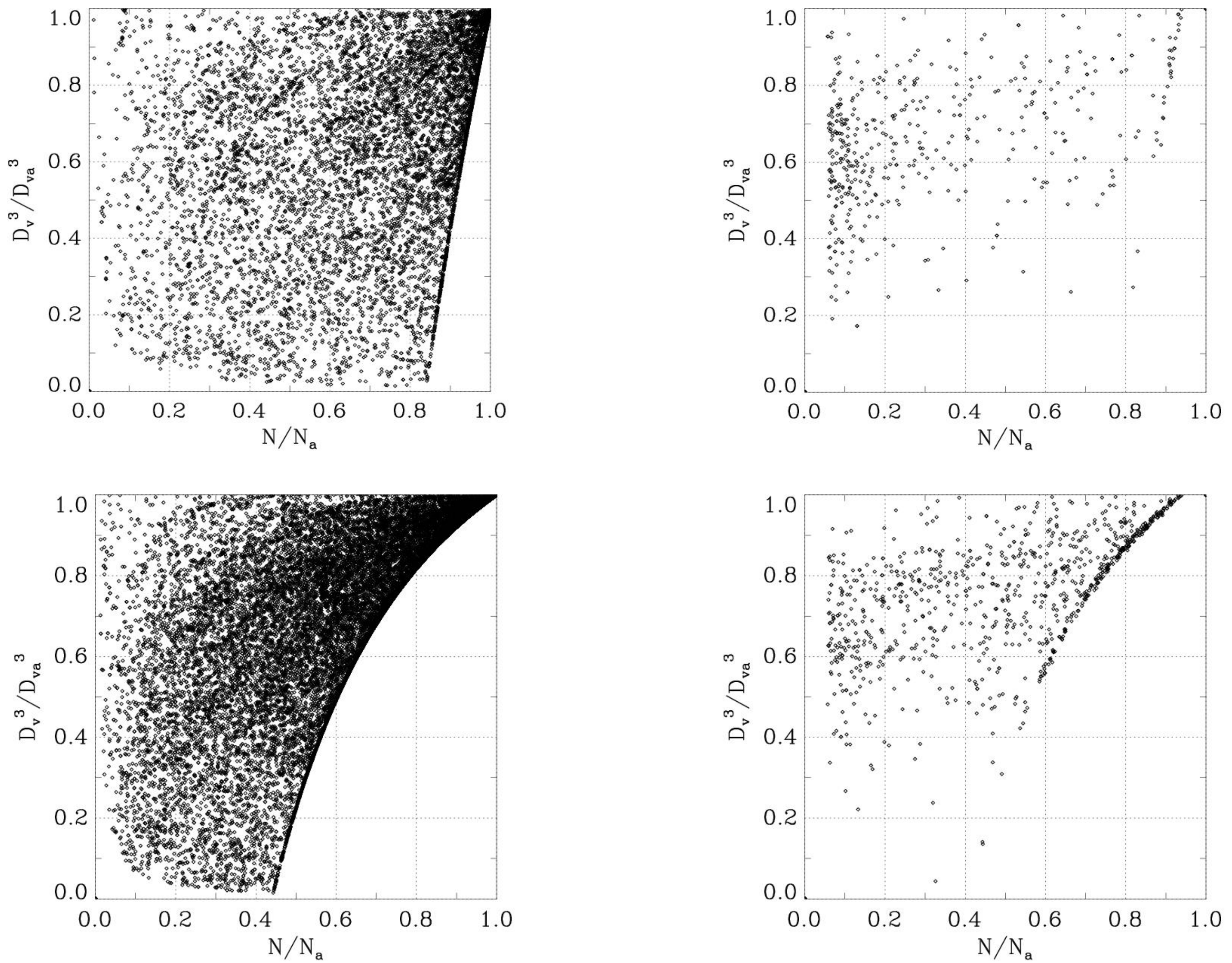


TO DO NEXT:

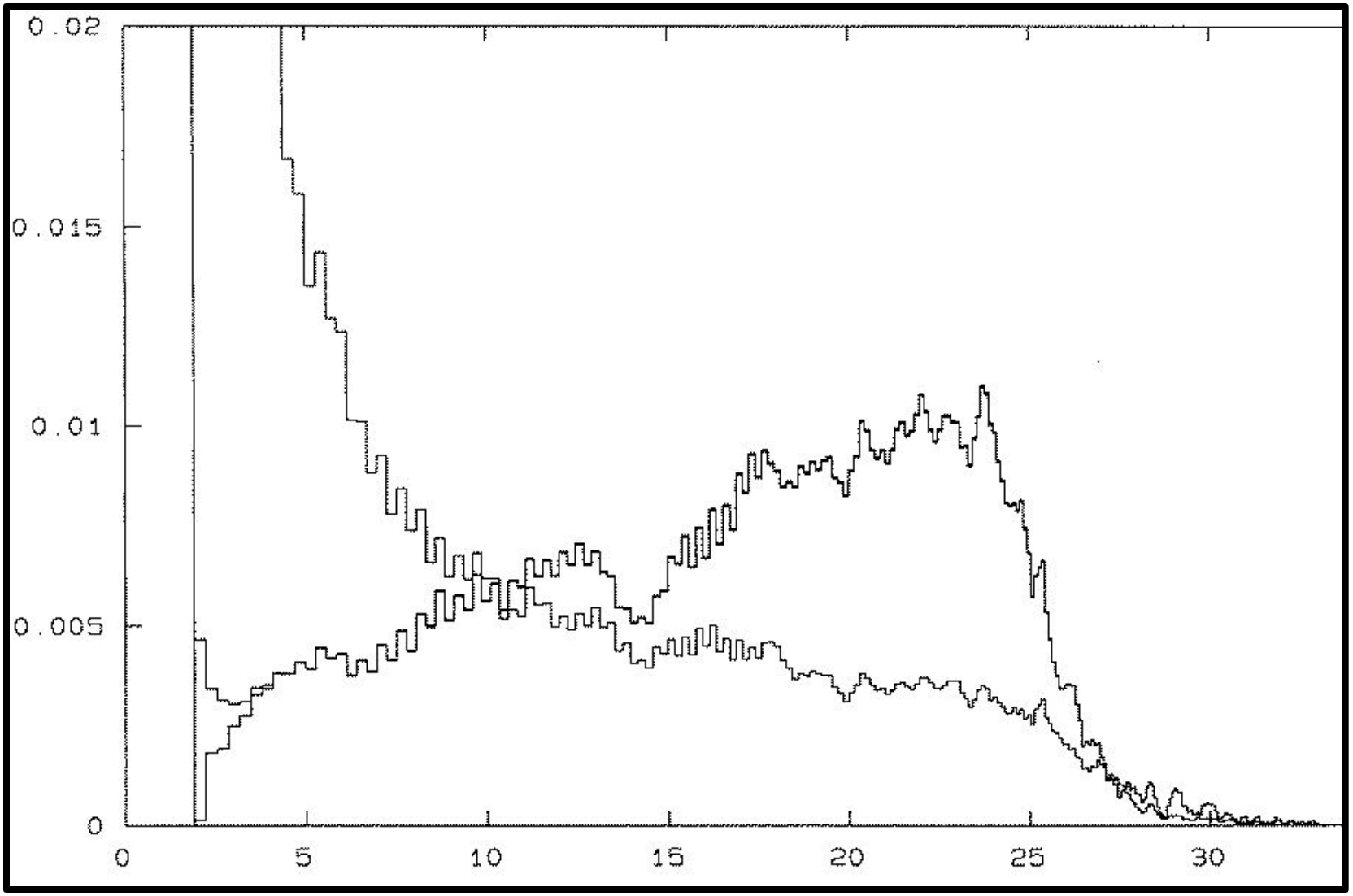
- statistics of CDNC => Na (optimal filter)
- cloud base level study => D_{va}
- continue high rate processing

Instrumental artefact

Average by the FFSSP sa



Calibration Technique based on Ambiguities of Mie scattering.



Calibration Technique based on Ambiguities of Mie scattering.