Fast-FSSP Measurements

Frédéric Burnet, Jean-Louis Brenguier,
Jean-Michel Etcheberry and Thierry Bourrianne

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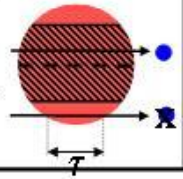
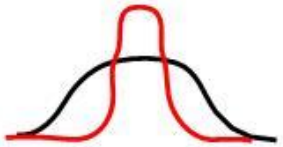
METEO FRANCE

Fast-FSSP improvements

	FSSP-100	Fast-FSSP
Data	Spectrum at 25 Hz, - total strobe - total reset - activity	For **each particle**: - Amplitude max - Pulse duration - Elapsed time } 16 MHz - DOF flag
Size	32 classes	255 classes
DOF 	1) Optical:  2) Electronic: pulse duration 	Optical only with 2 diodes:  

FFSSP Data Base overview

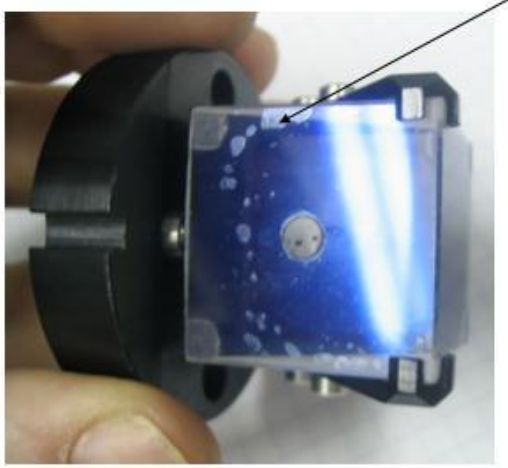
Date	Dec 2004									Jan 2005									
	07	08	09	10	13	16	17	19	20	05	07	11	12	14	16	18	19	23	24
RF	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**17**	**18**	**19**	**20**
Data	large DOF													DTV					?

Good

inaccurate sizing and/or counting

N/A

Calibration checking



Salt deposition due to rain

↓

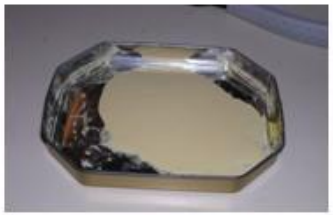
Decreases the amount of scattered light collected by the photodiodes

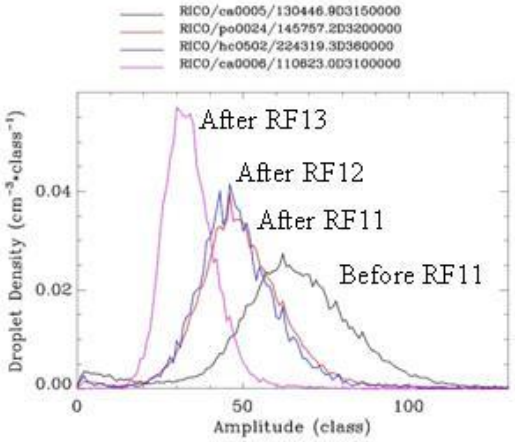
↓

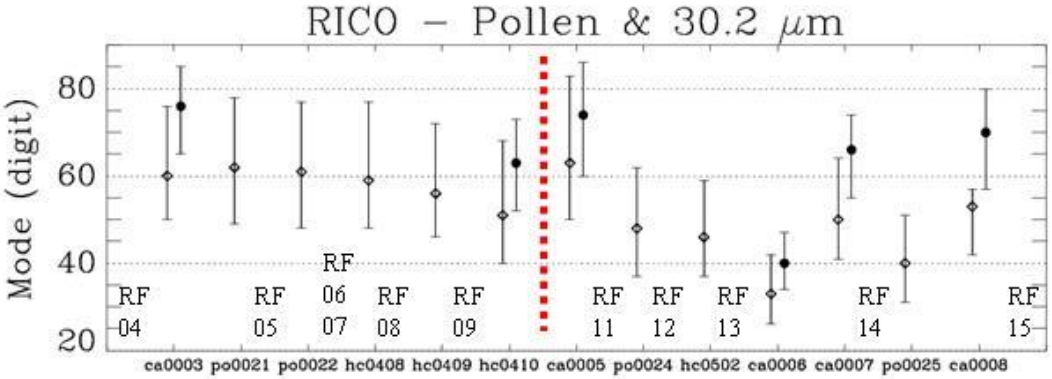
Calibration should be checked after each flight with lycopodium and/or glass beads

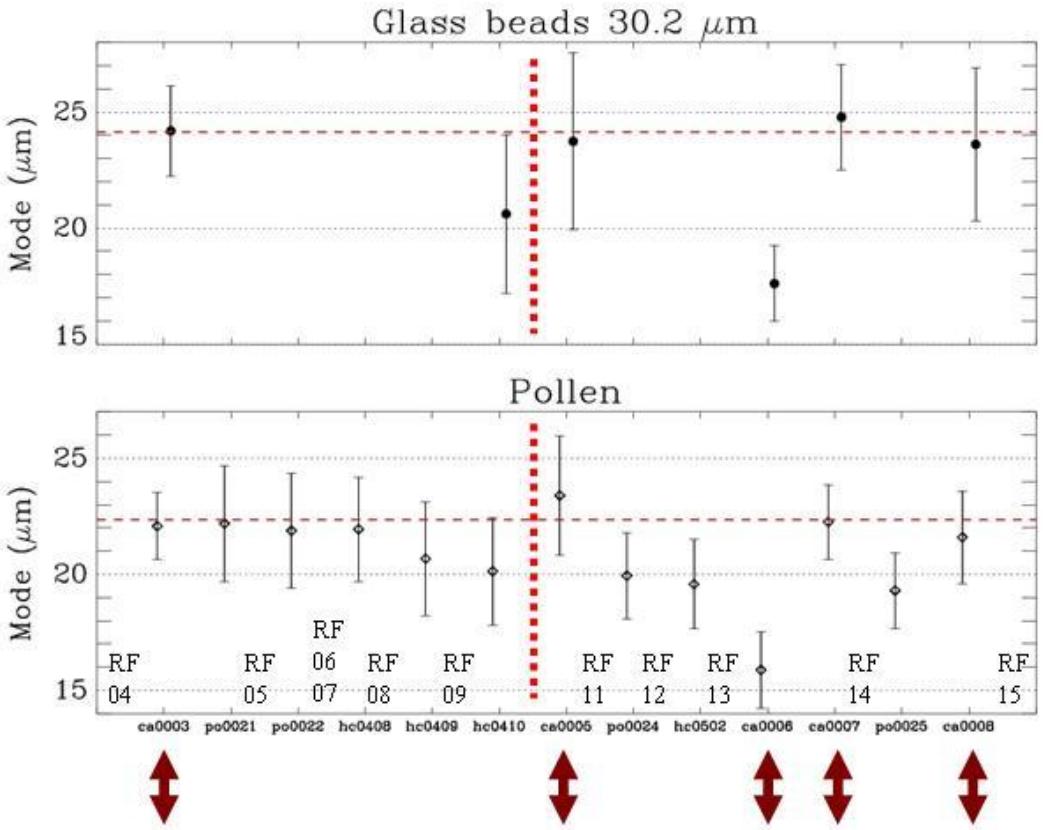
Calibration checking

Lycopodium :

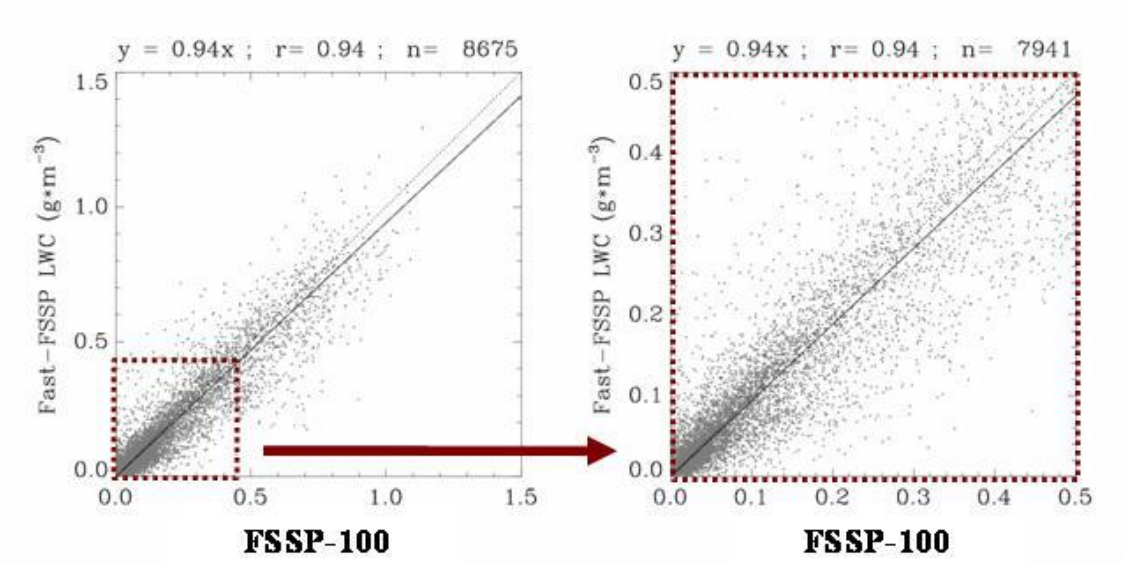




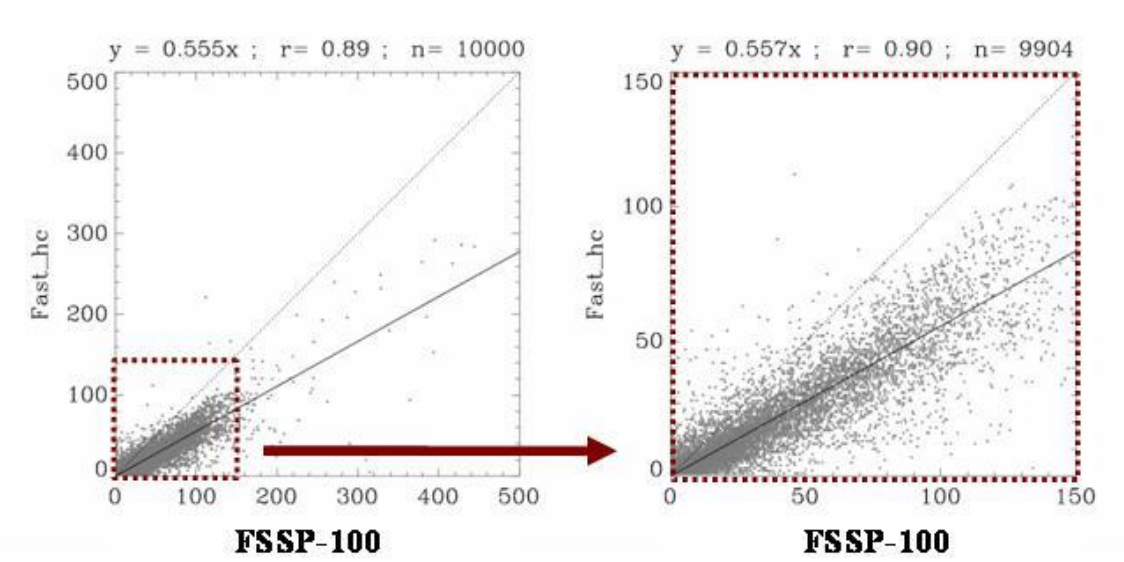



Glass beads 30.2 μm
Mode (μm)
25
20
15
Pollen
Mode (μm)
25
20
15
RF 04
RF 05
RF 06 07
RF 08
RF 09
RF 11
RF 12
RF 13
RF 14
RF 15
ca0003
po0021
po0022
hc0408
hc0409
hc0410
ca0005
po0024
hc0502
ca0006
ca0007
po0025
ca0008

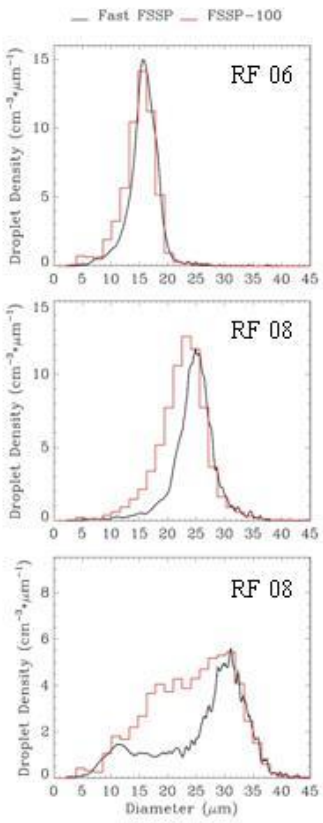
1 Hz LWC Comparison RF05, 06, 07, 08 & 09



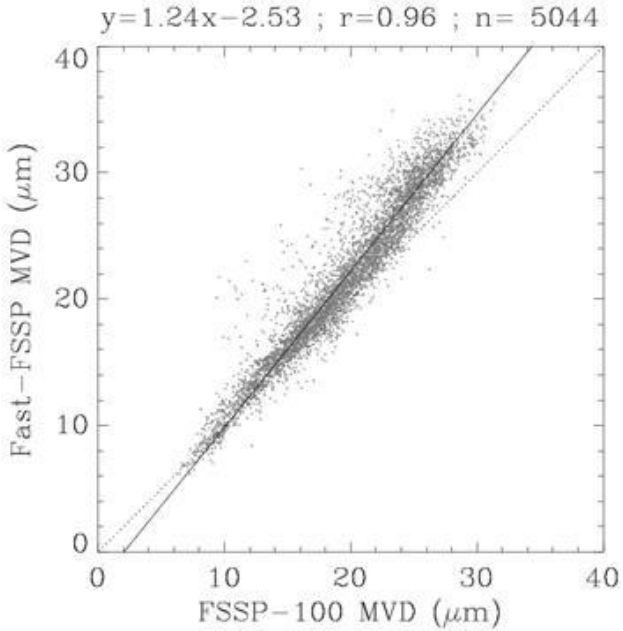
CDNC Comparison RF05, 06, 07, 08 & 09



MVD Comparison

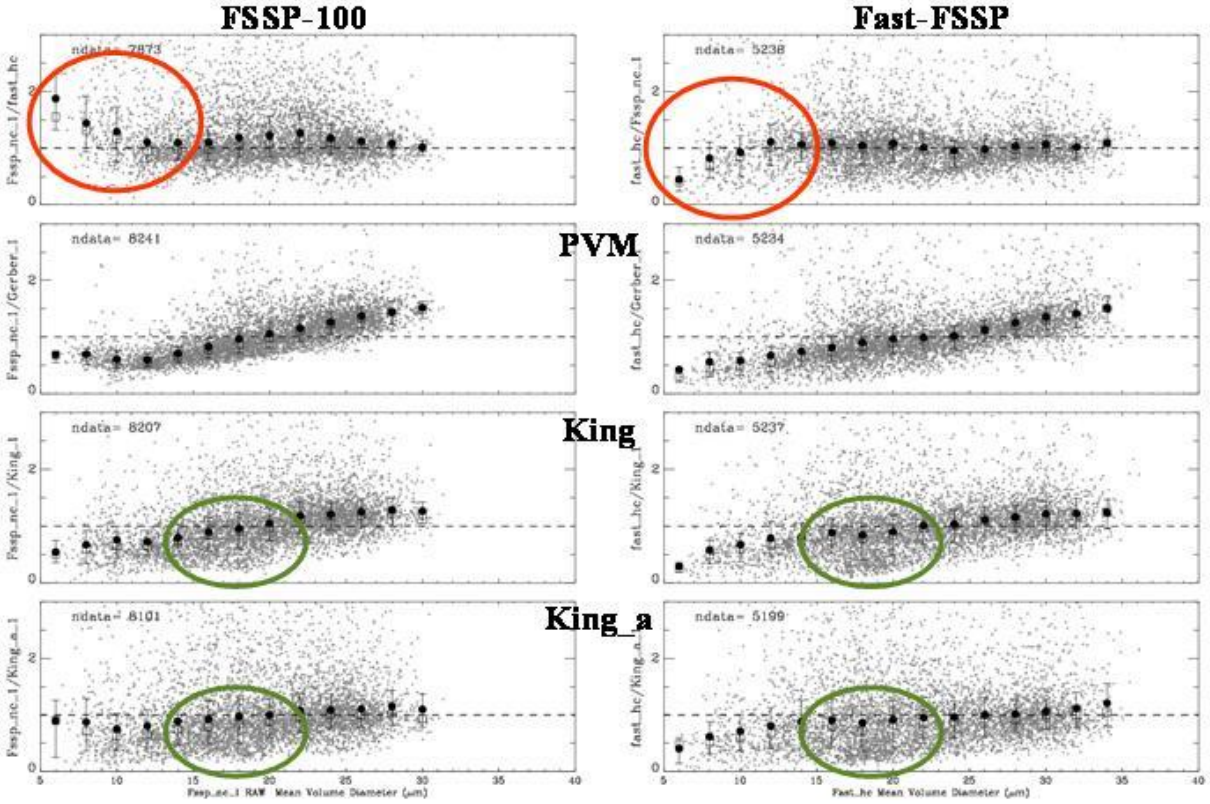


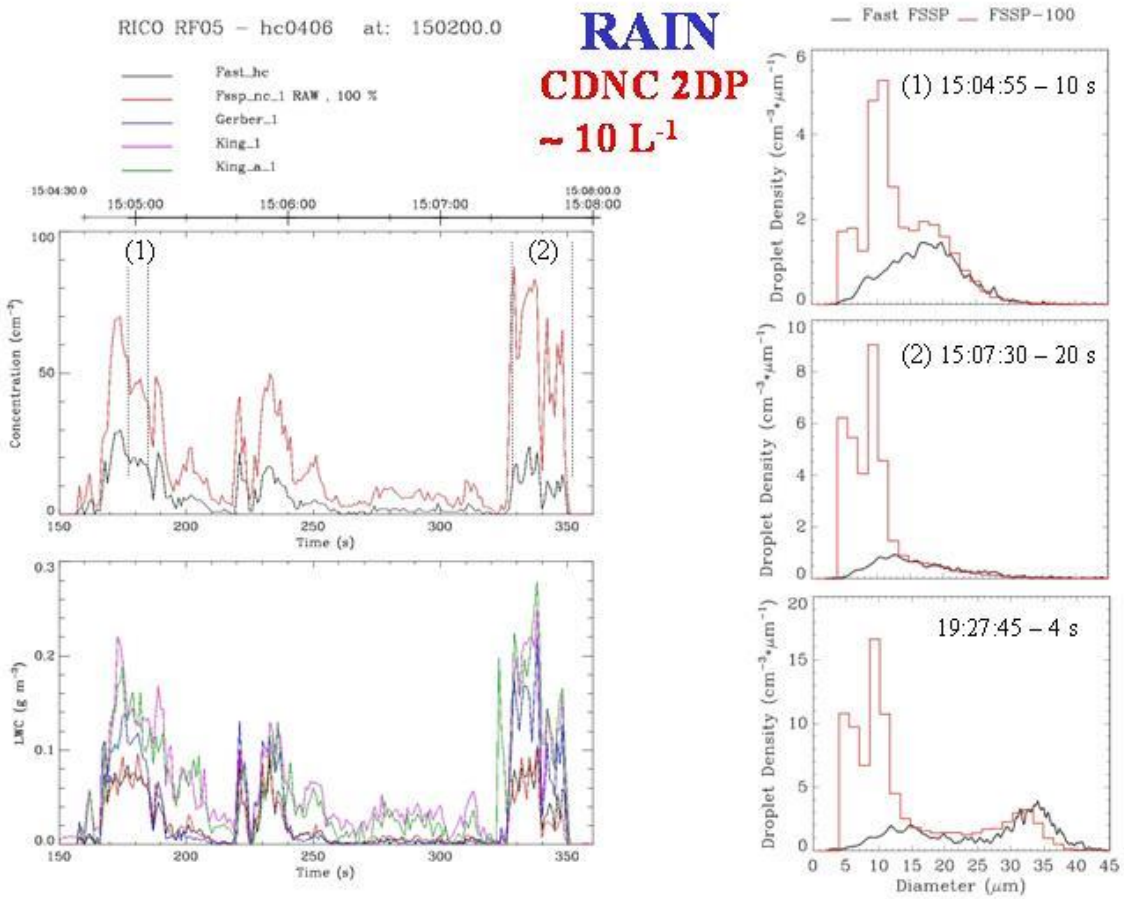
RF 05, 06, 07, 08 & 09



LWC Ratio

RF 05, 06, 07, 08 & 09

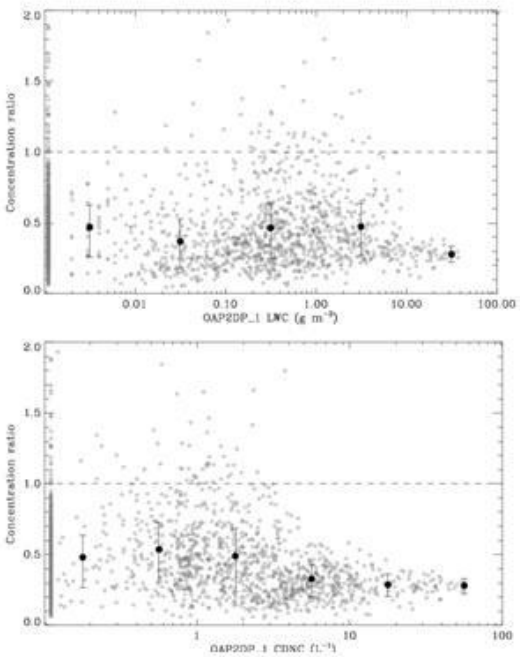



RAIN
CDNC 2DP
~ 10 L-1
RICO RF05 – hc0406 at: 150200.0
Fast_hc
Fssp_nc_1 RAW , 100 %
Gerber_1
King_1
King_a_1
15:04:30.0
15:05:00
15:06:00
15:07:00
15:08:00.0
15:08:00
(1)
(2)
Concentration (cm-3)
Time (s)
LWC (g m-3)
Fast FSSP
FSSP-100
(1) 15:04:55 – 10 s
(2) 15:07:30 – 20 s
19:27:45 – 4 s
Droplet Density (cm-3•μm-1)
Diameter (μm)

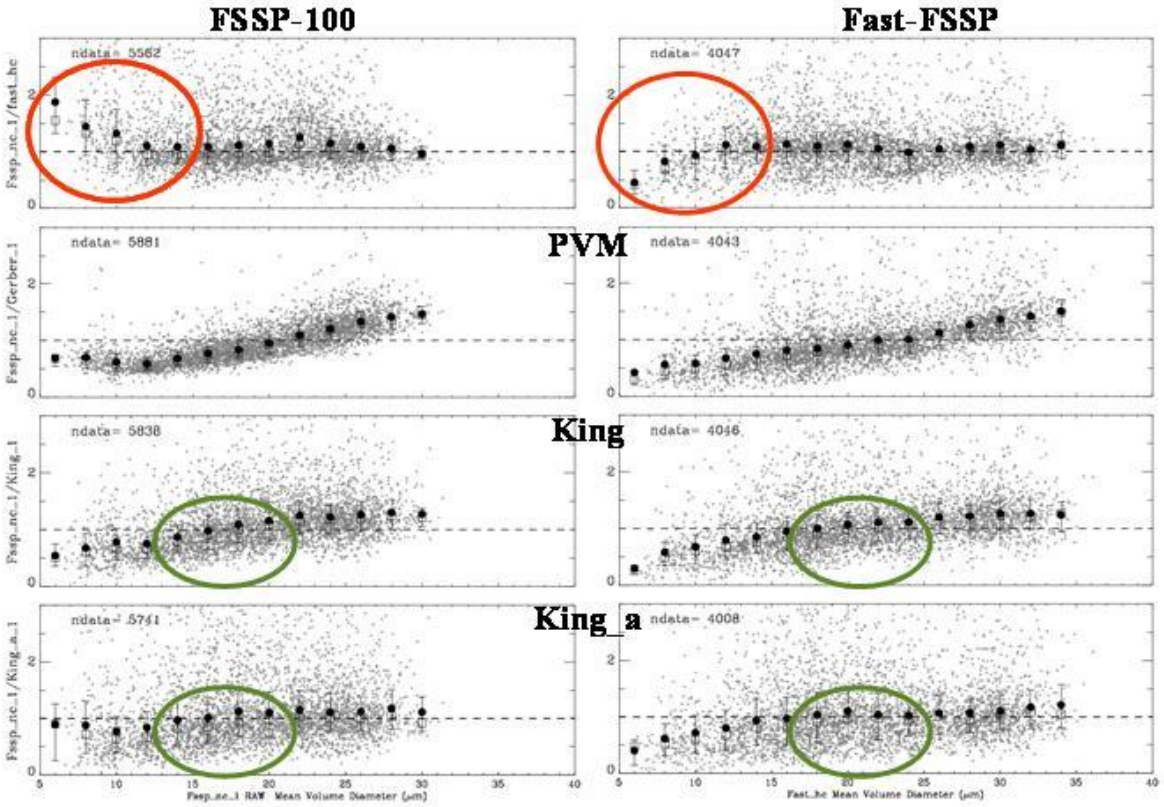
CDNC ratio as fct of 2DP

RICO RF05 – hc0406

Concentration ratio vs 2DP: ndata=1736



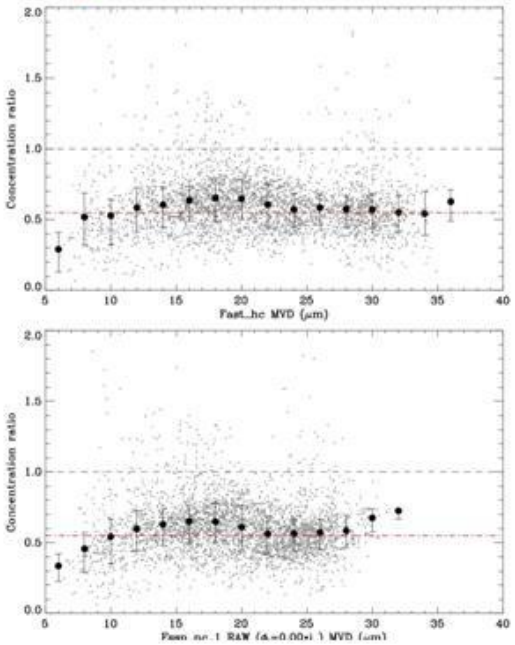
LWC ratio RF 05 06, 07, 08 & 09 CDNC 2DP < 1 L^{-1}



CDNC Comparison

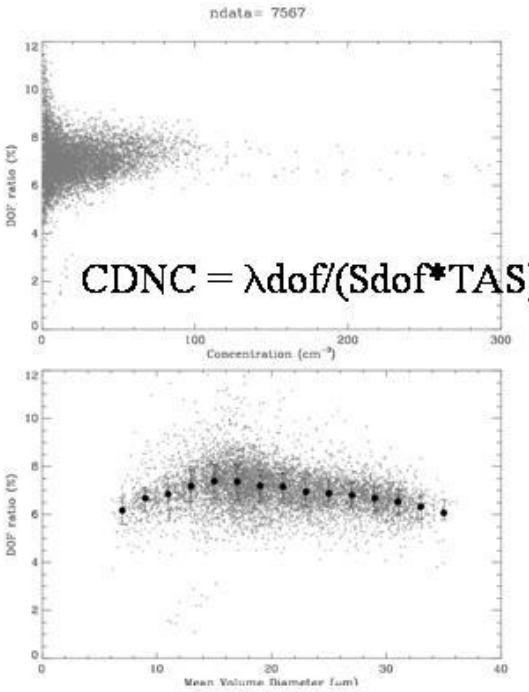
RF05 06, 07, 08 & 09

CDNC 2DP < 1 L^{-1}



Fast-FSSP DOF ratio

$Rdof = \lambda dof/\lambda \cong Sdof/Stot$



$CDNC = \lambda dof/(Sdof*TAS)$

Summary

Much more work is needed to validate the complete data set !

Total droplet concentration:

- actual CDNC probably in between !!
- Fast underestimates when MVD < 12 μm probably due to the variation of the sampling section
- FSSP-100 overestimates particularly when precipitations : spurious counts?

Sizing:

- there is a bias between the Fast and the FSSP-100 calibrations which becomes important when MVD > 25 μm: glass beads calibrations need to confirm by the self-calibration methode.
- the FSSP-100 pulse duration selection leads to underestimation of the droplet size when the spectrum is broad.

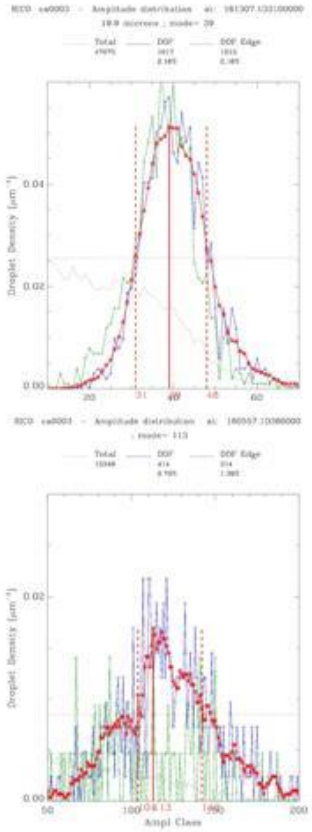
Summary (continue)

LWC:

- Agreement between Fast and FSSP-100 due to compensation of errors on CDNC and size.
- Underestimation of both spectrometers when precipitations
- Size dependence of the PVM response

Fast processing perpectives:

- **Release of the preliminary data set in september.**
- Investigate the size dependence of the sampling section at the laboratory to establish a correction procedure.
- Take into account the loss of sensibility due to the salt accumulation on the probe optics.
- A main limitation comes from the poor statistics due to very low CDNC values: use of the optimal estimator of Pawlowska et al.



Calibration uncertainties