



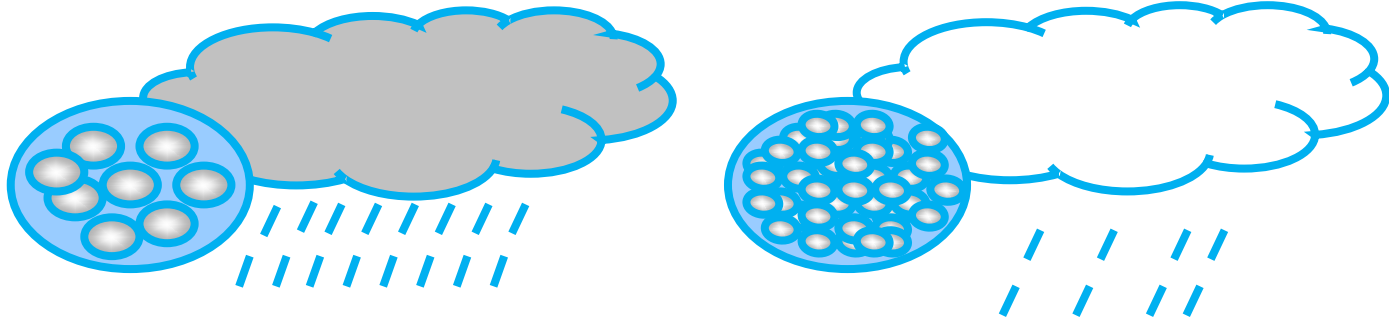
EFFECTS OF AEROSOLS ON SHALLOW CUMULI SAMPLED DURING RACORO

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CLASSICAL 2ND AEROSOL INDIRECT EFFECT



Increase in aerosol concentrations

Decrease in the size of cloud droplets

Reduce the precipitation efficiency

Increase in liquid water content

Increase in cloud lifetime

QUESTIONS

- 1. For shallow cumuli, does the droplet size decrease and droplet concentration increase with aerosol concentration?
- 2. Does LWC increase with aerosol concentration ?

Routine AAF Clouds with Low Optical Water Depths (CLOWD) Optical Radiative Observations (RACORO)

Where : in the vicinity of the ACRF SGP site, OK

When : from January to June 2009

What : Routine measurements of aerosol, cloud , and radiative properties

Data : 260 hours flight time
=> 85 hours of shallow cumuli conditions
=> **2,337 cumuli sampled**

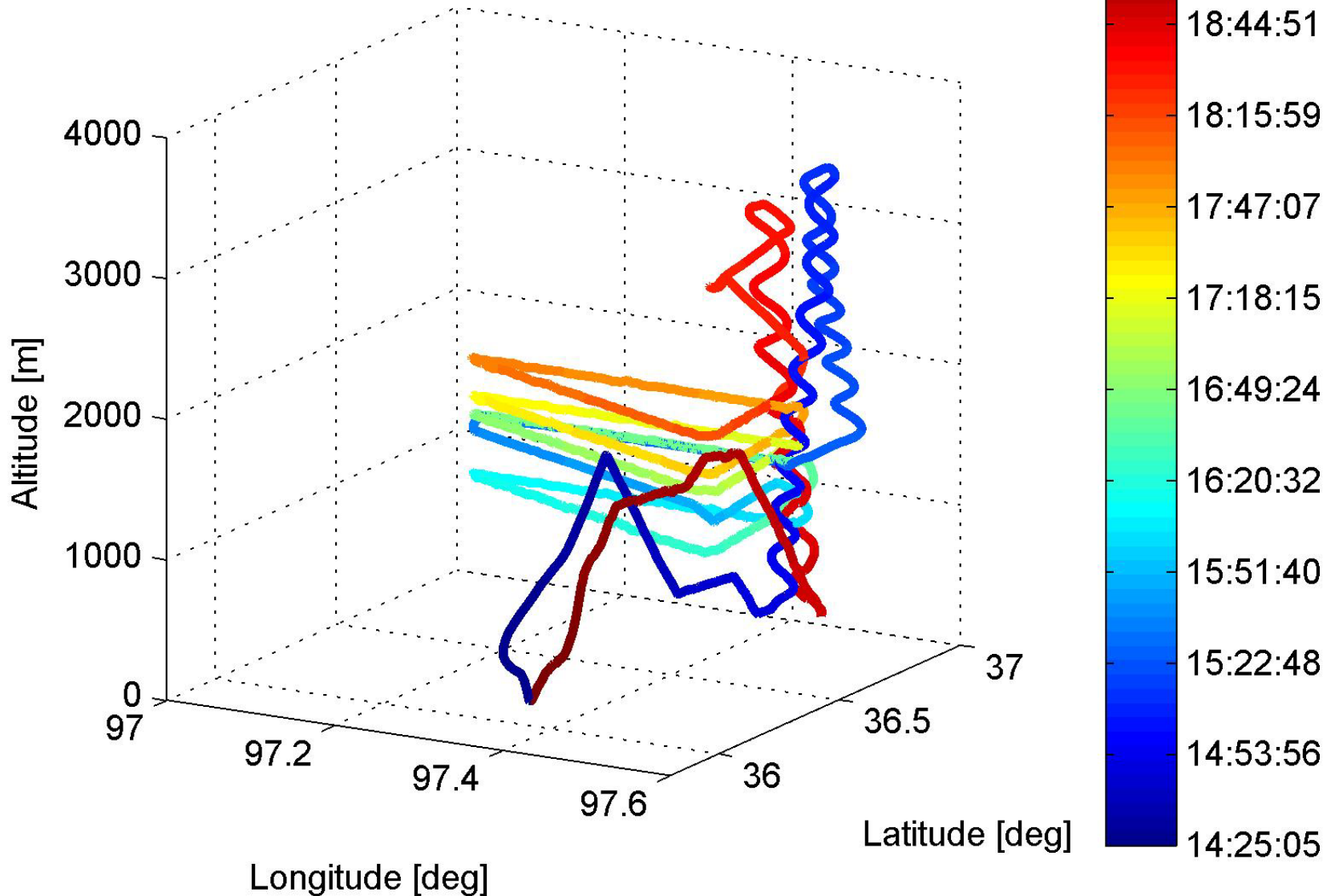
RACORO INSTRU

Instrument	Measur
UFCPC	Na
CPC	
PCASP	N(D)
FSSP	
CAS (CAPS)	
1-D CIP (CAPS)	
2-D CIP	N(D), ima
2DS	
Gerber probe	Bulk LW
SEA probe	
Hot-wire	

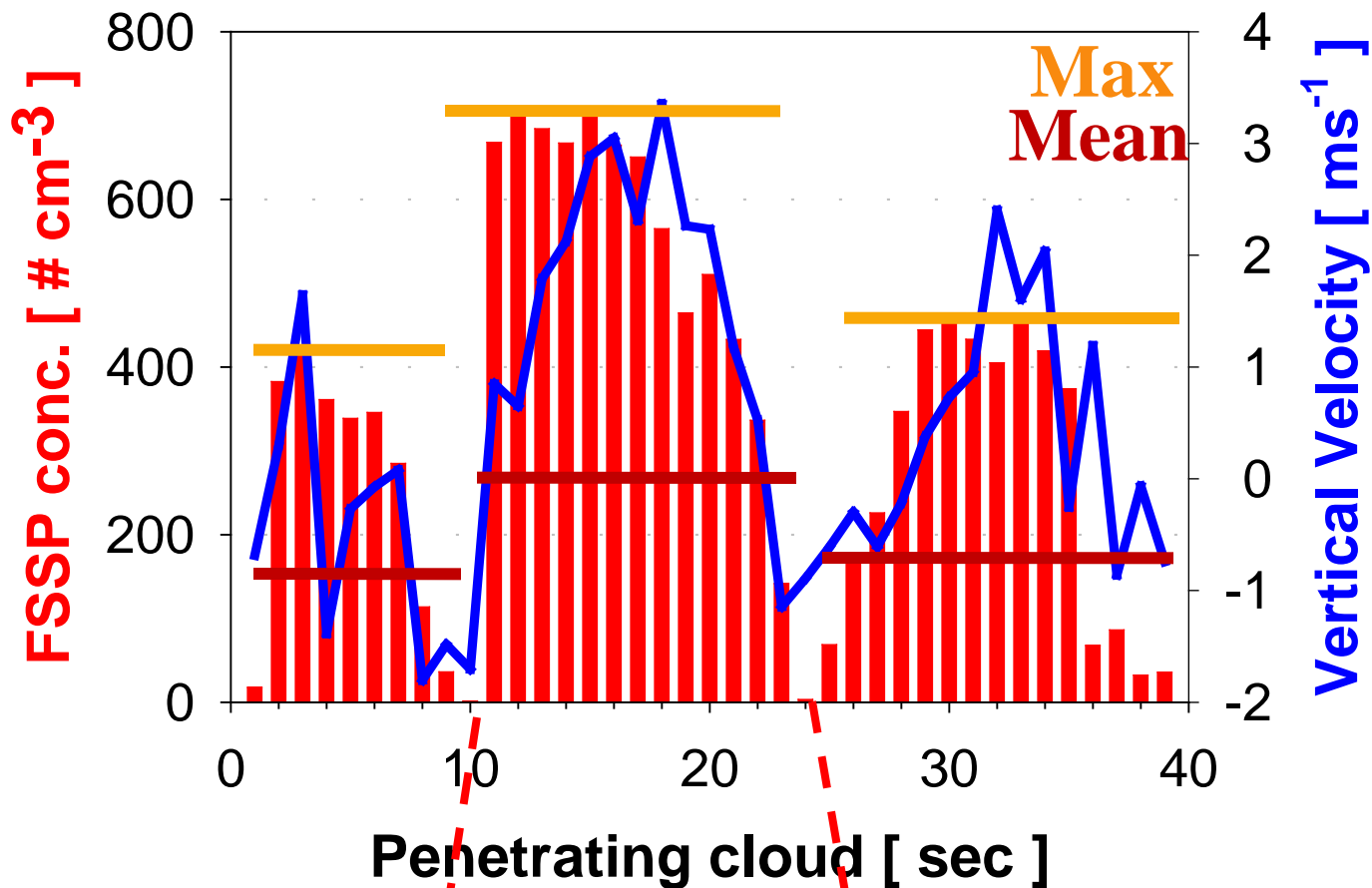


FLIGHT TRACK

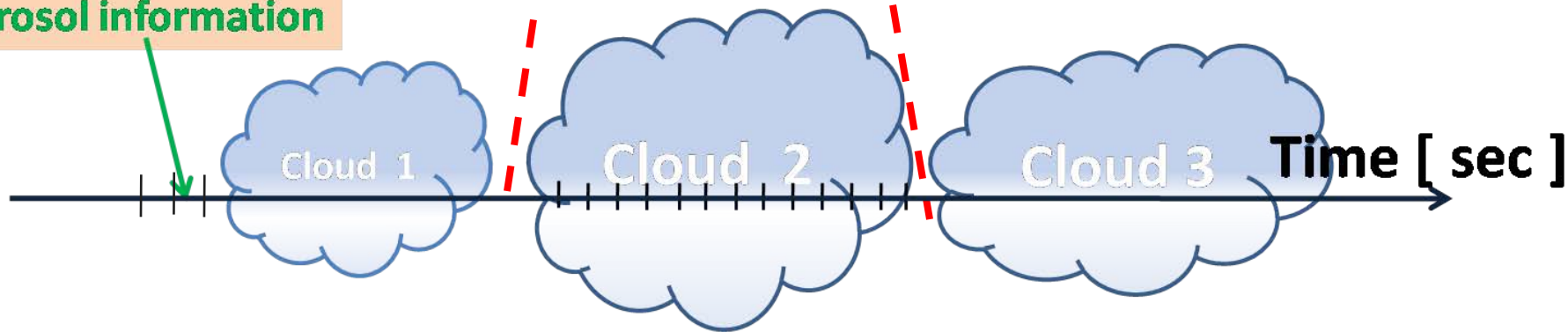
RACORO 090523



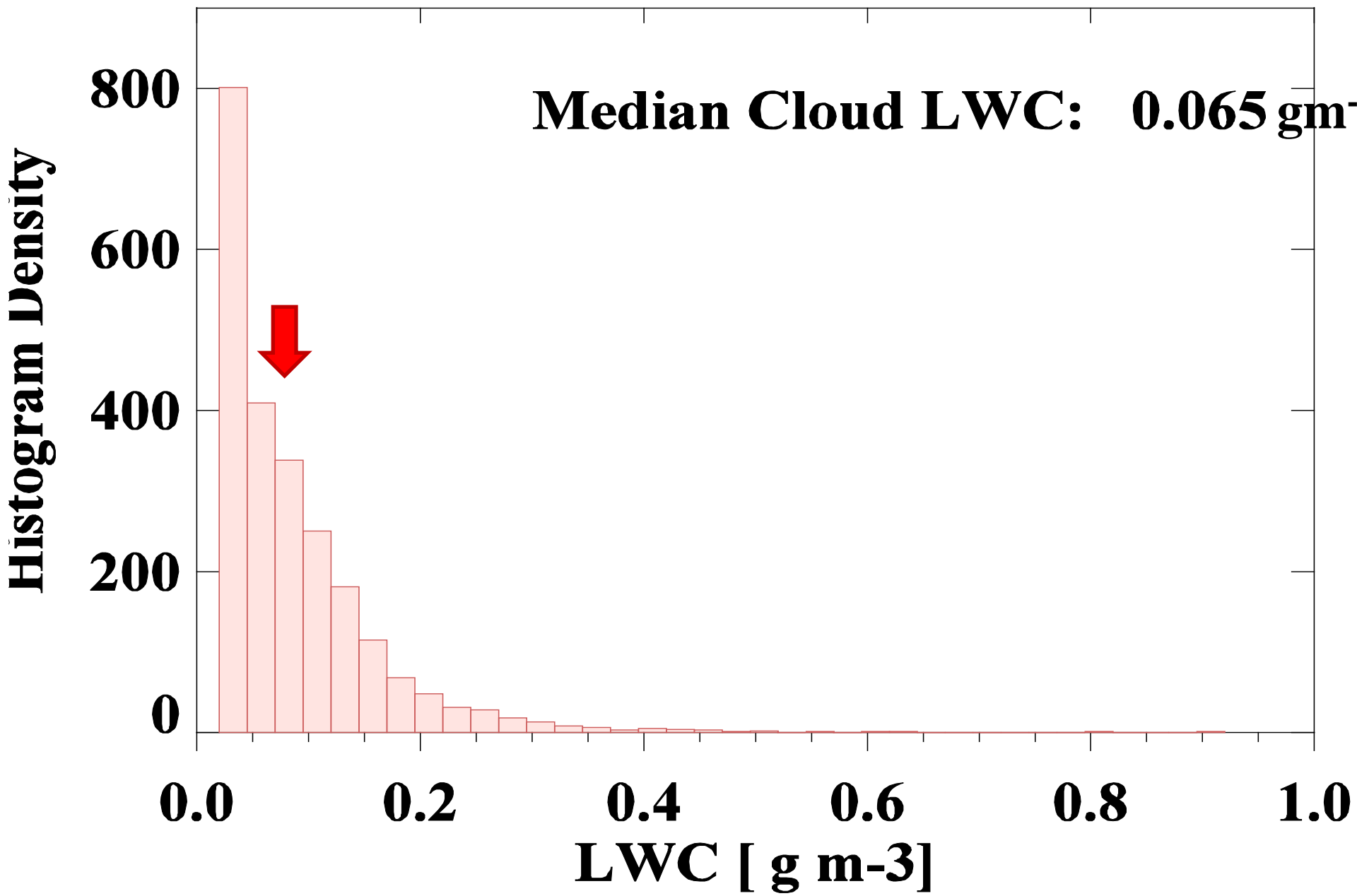
HOW TO DEFINE INDIVIDUAL CLOUD ?



Aerosol information



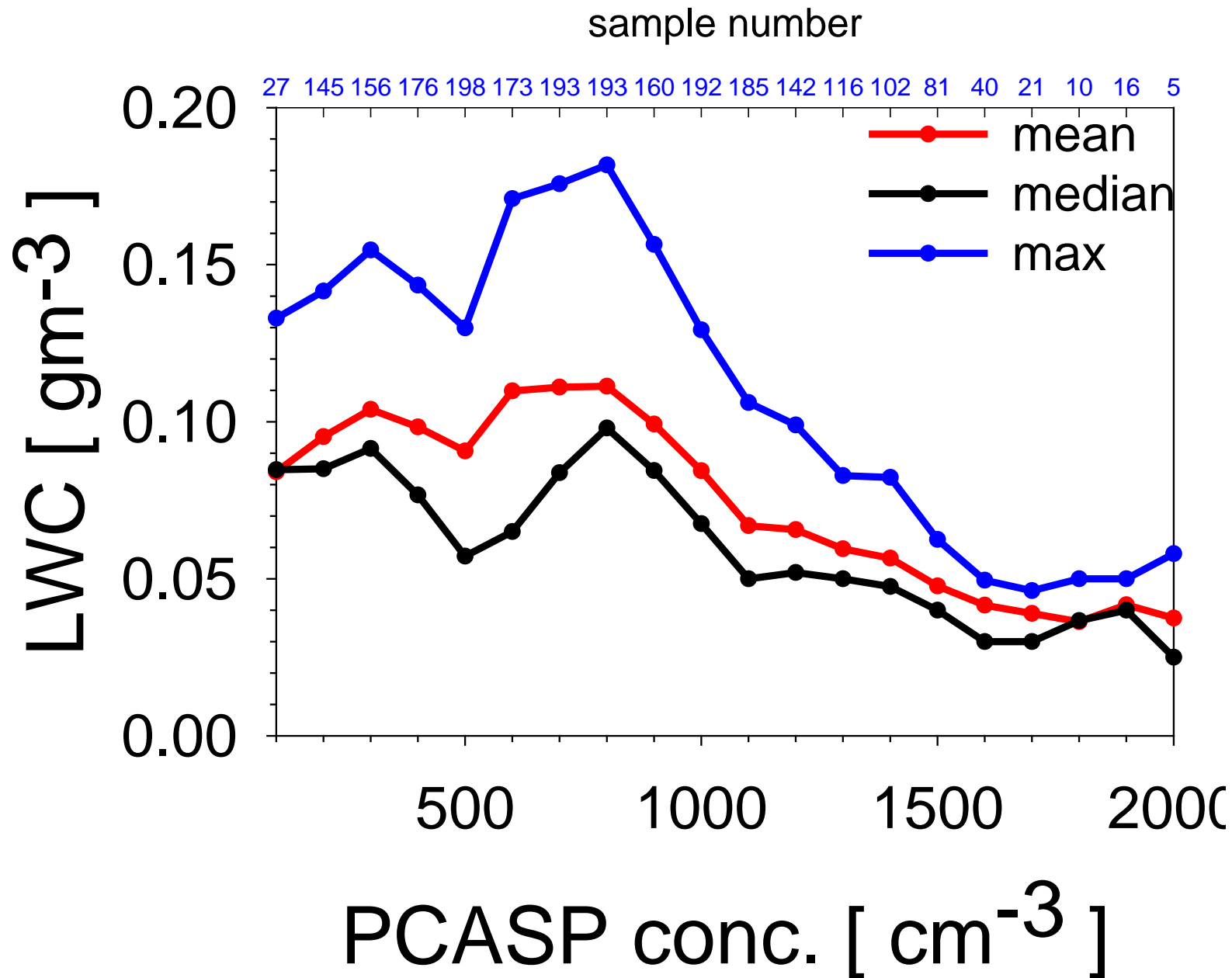
RACORO CUMULI STATISTICS

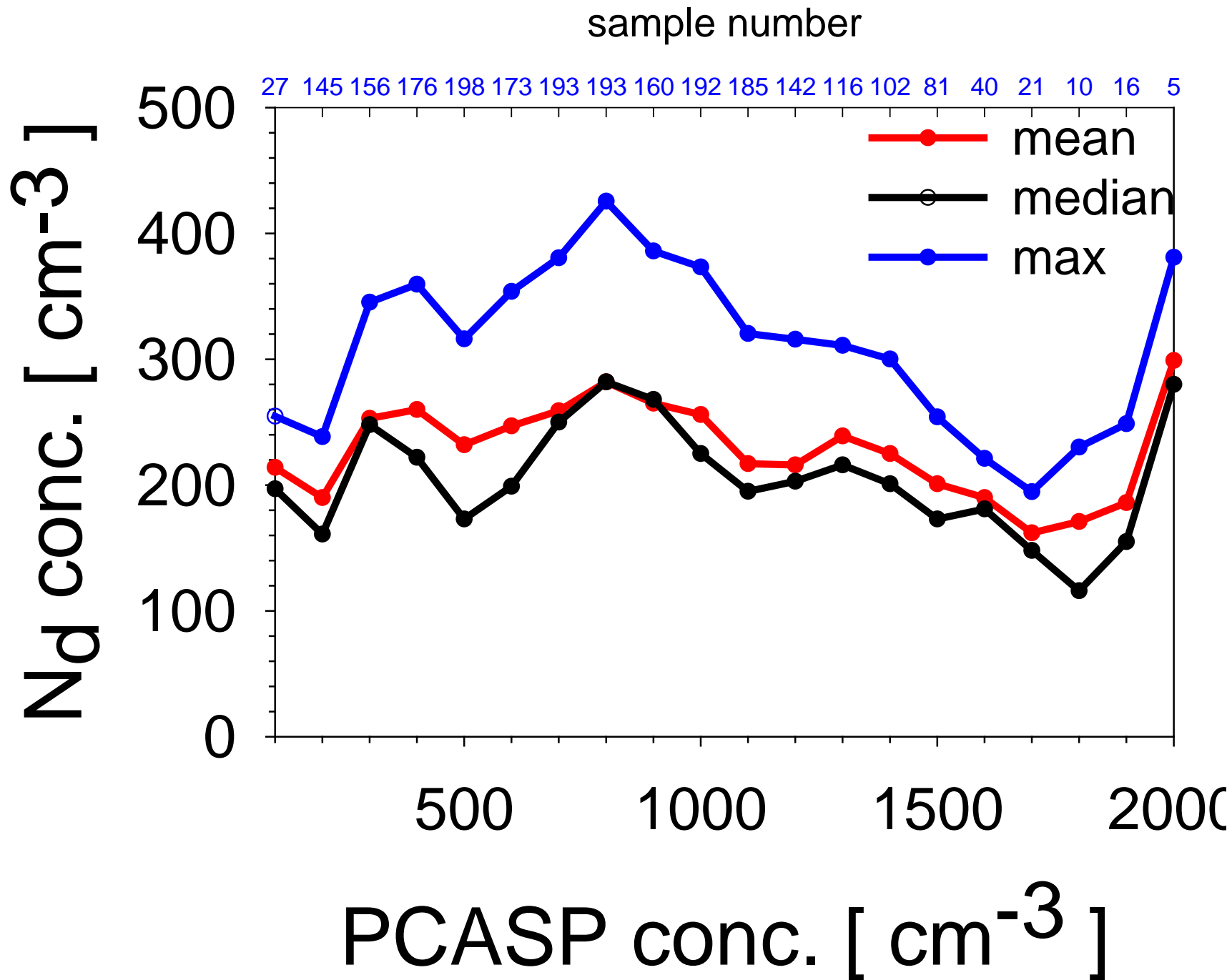


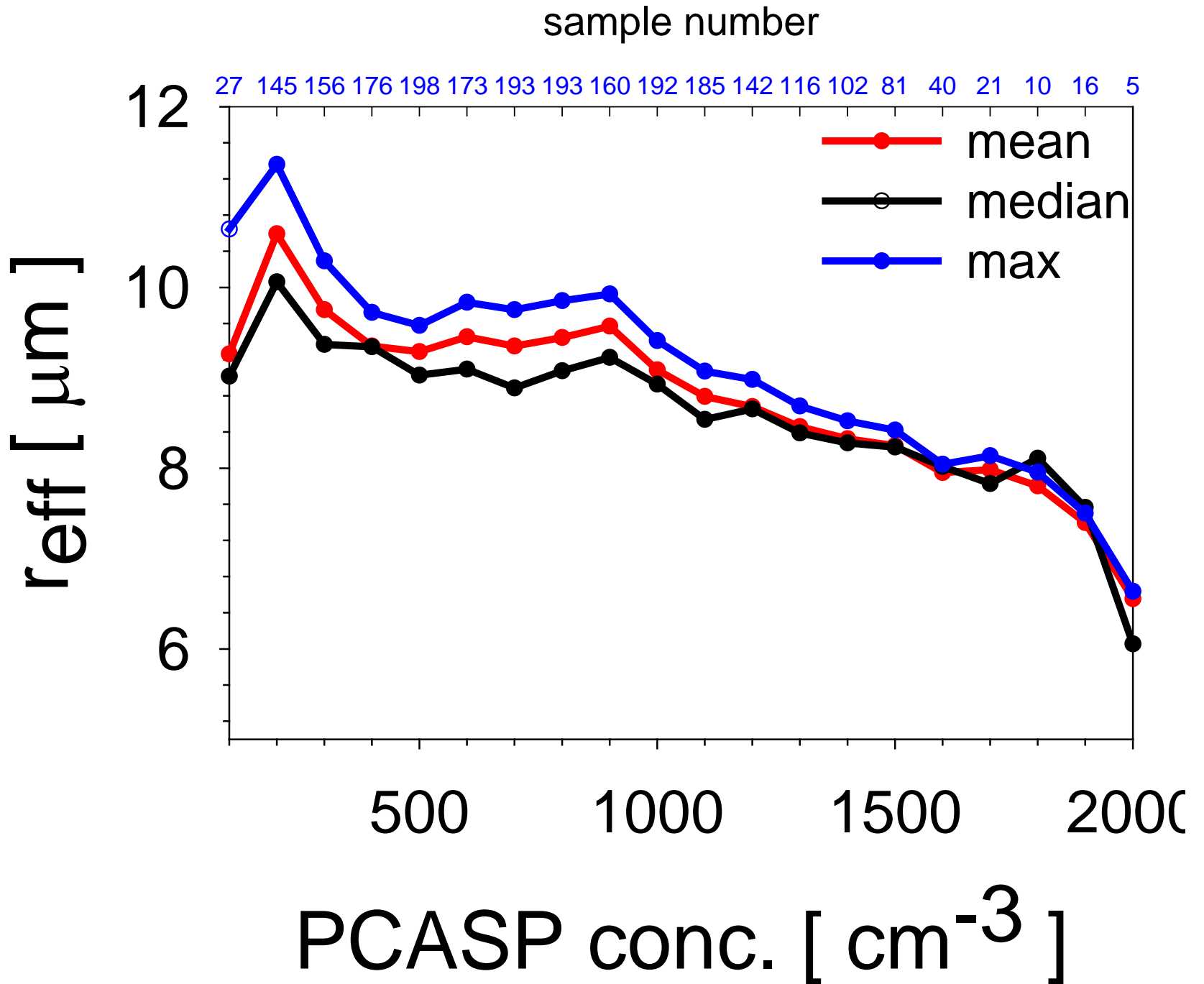
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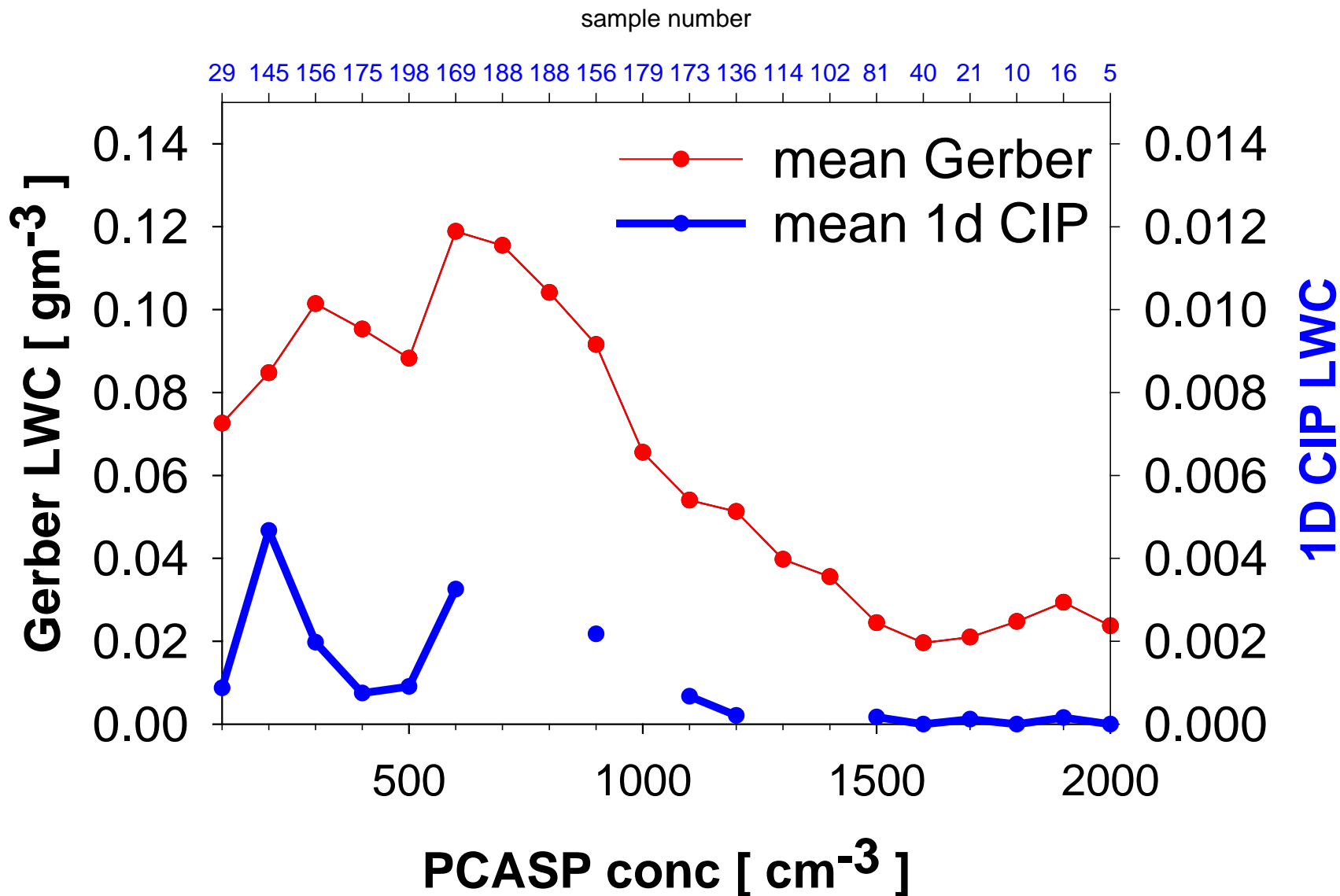
AEROSOL – CLOUD INTERACTION



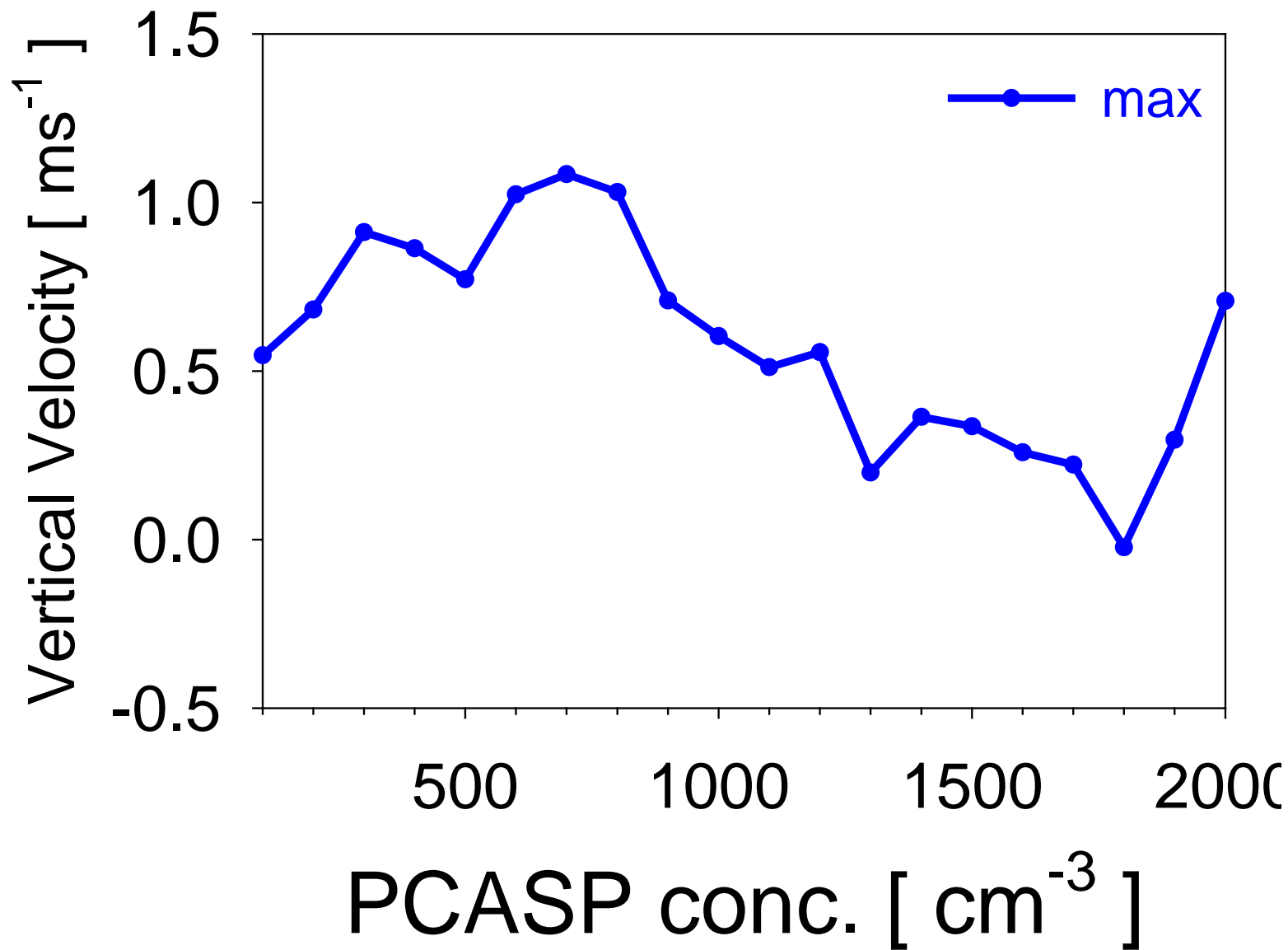




DRIZZLING OUT IS NOT A FACTOR FOR A DECREASES OF LWC !



VERTICAL VELOCITY



CONCLUSION

- ✓ 2,337 cumuli sampled during RACORO offer good database to statistically investigate dependence of cloud properties on aerosol concentrations.
- ✓ LWC decreases as PCASP concentration increases, different from classical 2nd aerosol indirect effect.
- ✓ Decrease in LWC explained by decrease in vertical velocity inside clouds as PCASP concentration increases.
- ✓ R_{eff} decreases as PCASP concentration increases.



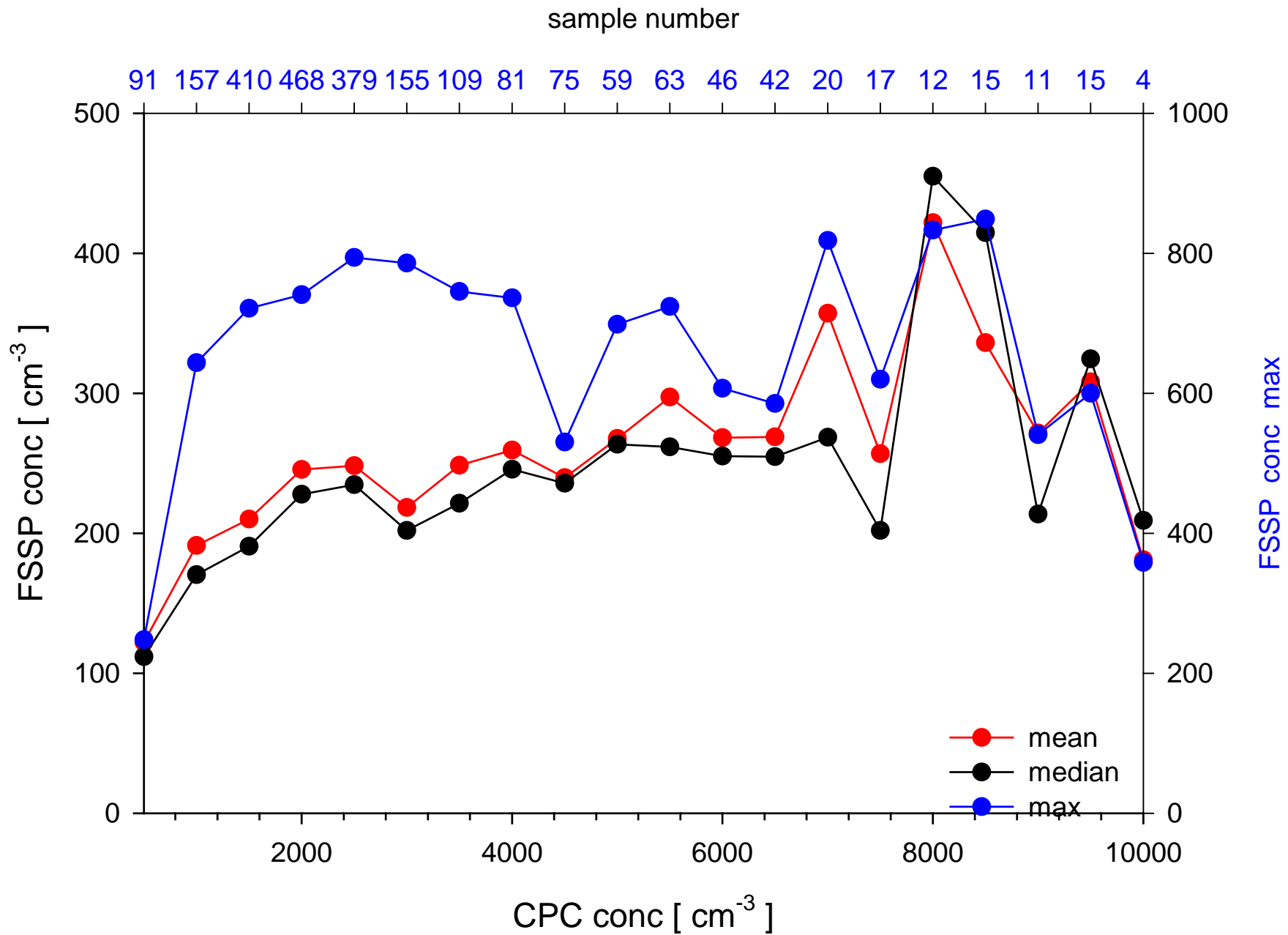
Thank you !

***Poster in this afternoon**

Hee-Jung Yang, Greg McFarquhar, Haf Jonsson:

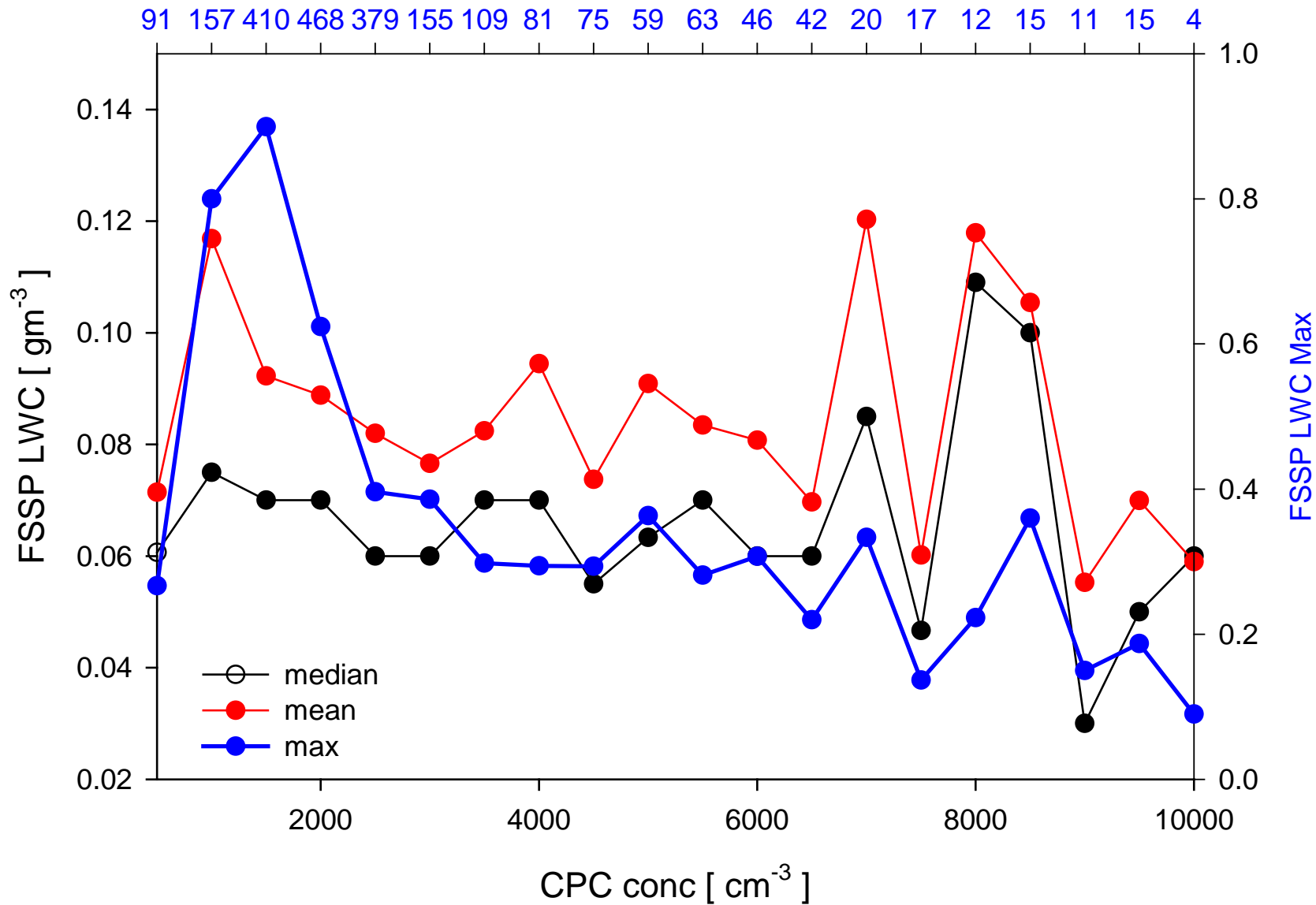
Effects of aerosols on shallow cumuli sampled during RACORO

RACORO cumulus: 2337 clouds



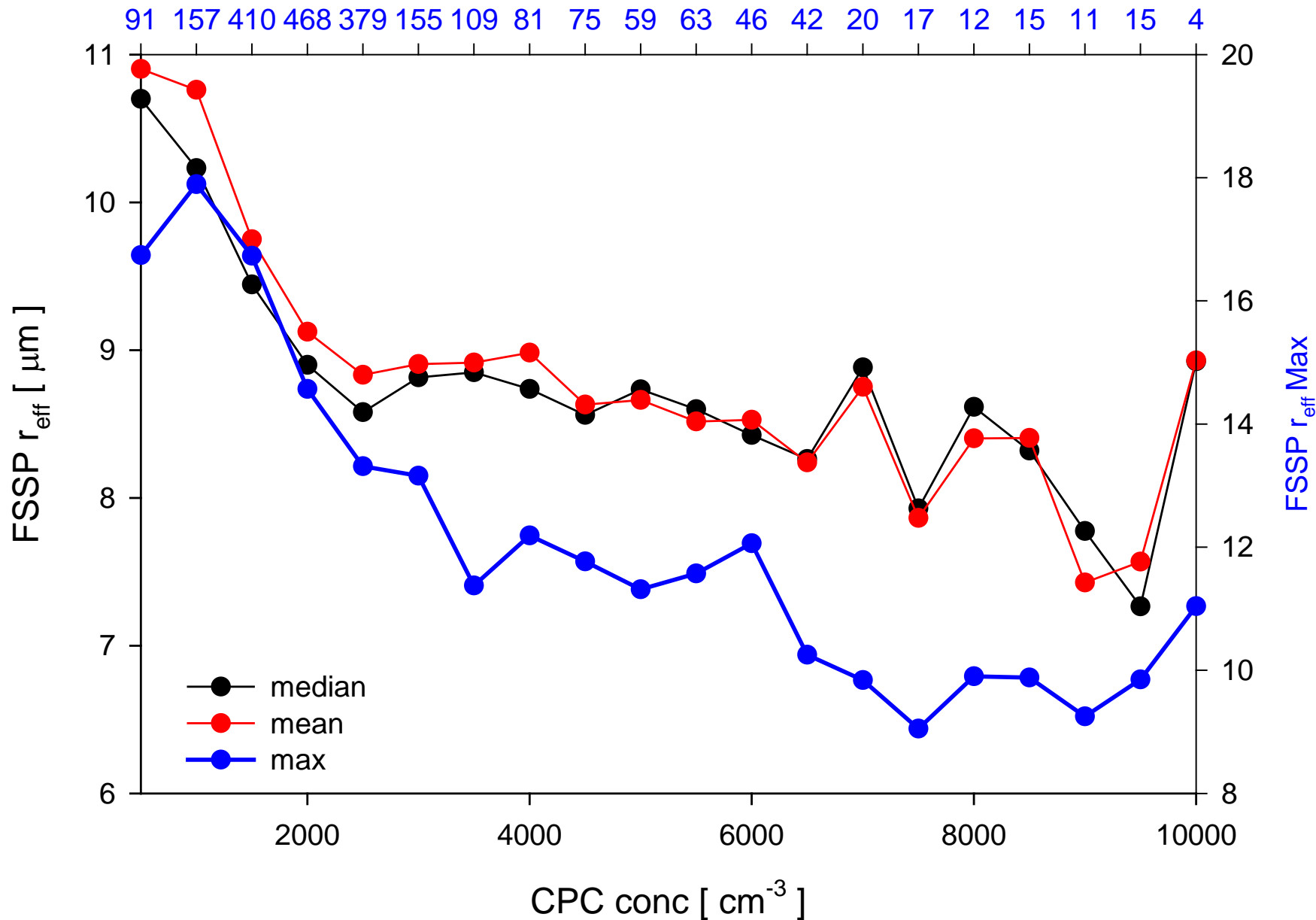
RACORO cumulus: 2337 clouds

sample number



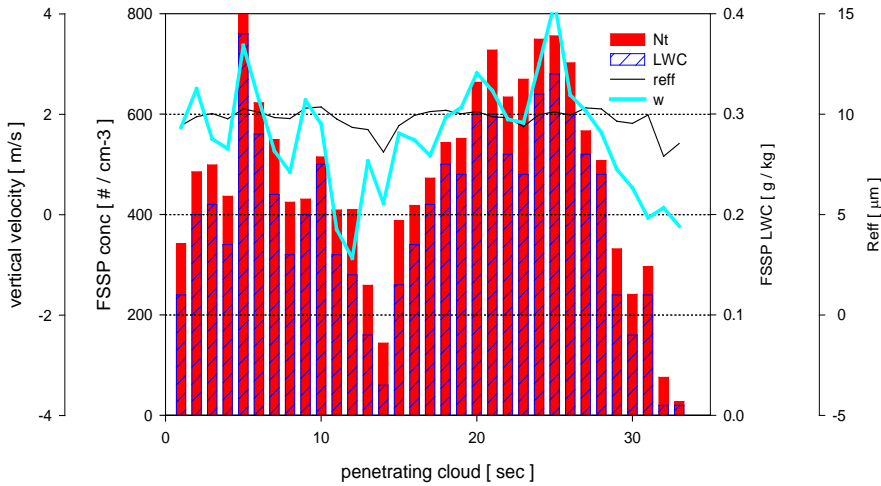
RACORO cumulus: 2337 clouds

sample number

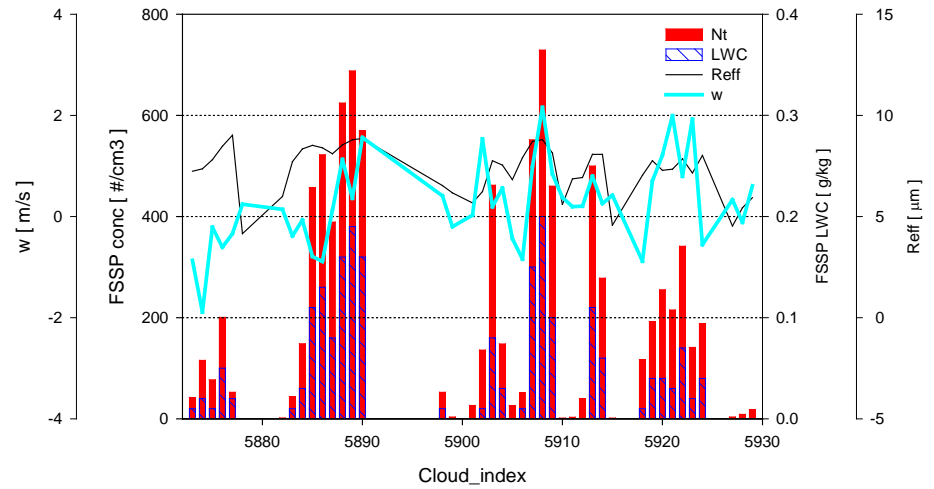


CLOUD SAMPLES

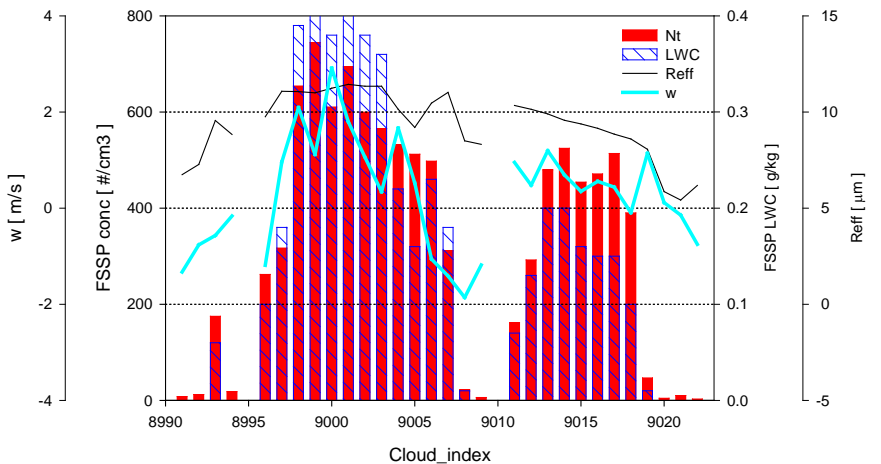
Cloud #112_20:54:11



19:50:14 ~ 19:51:10
Alt ~ 960 m



090522 20:42:12~ 20:42:43
Alt ~ 1270 m



090523 16:54:59 ~ 16:55:27
Alt ~ 1530 m

