CCN Properties During 2005 MASE

Y.-N. Lee, J. Hudson, J. Wang, L. Alexander, J. Jayne,
S. Springston, G. Senum, L. Kleinman, and P. Daum

- ***Intercomparison***
- ***In-cloud measurement and implications***
- ***Effects of aerosol chemical composition***
- ***VOCALS-ASP***

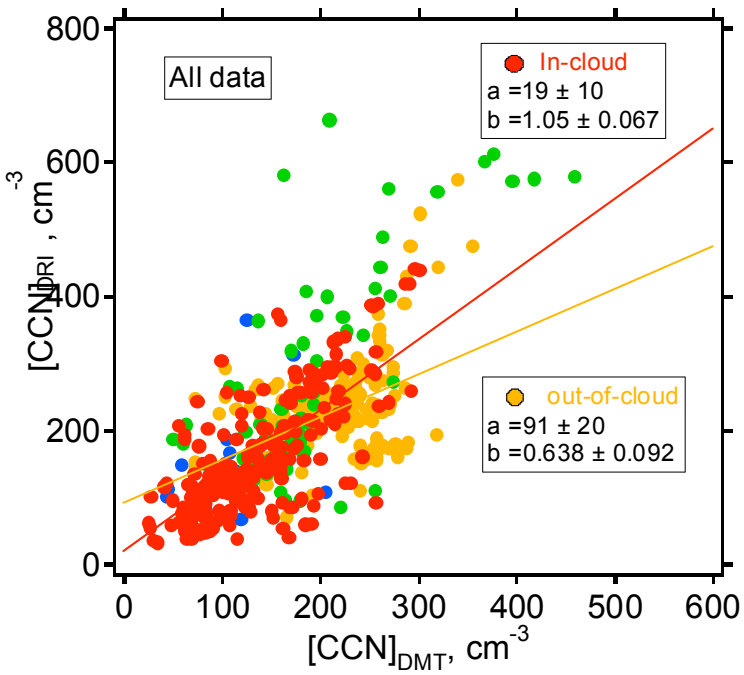
Particle Measurements during MASE

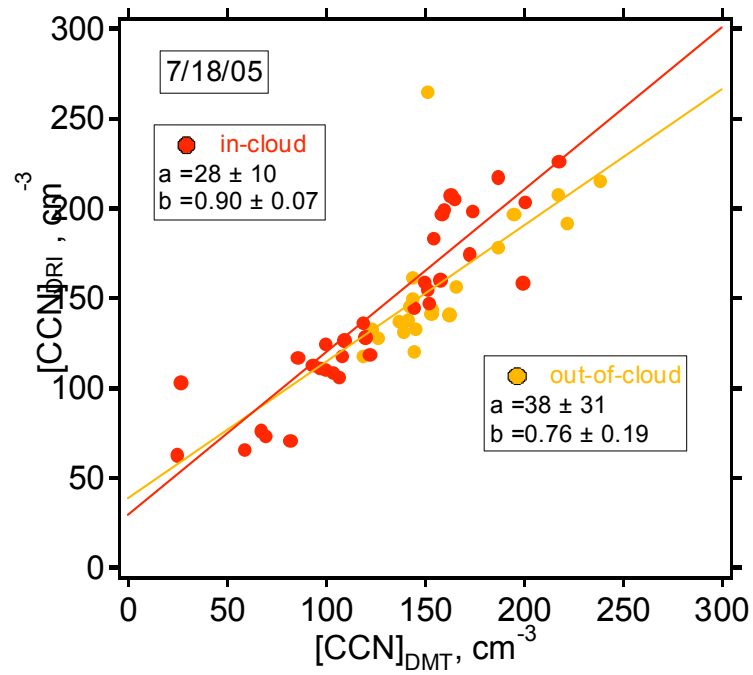
Instruments	***Time resolution***	***Products***
DRI CCN Spectrometer	1 s	%SS level: 0.02, 0.04, 0.06, ***0.08***, 0.10, ***0.20***, 0.30, 0.6, 1.0
DMT CCN Counter x2	1 s	%SS level: **0.085, 0.022**
PCASP	1 s	0.106 μm – 2.645 μm
DMA	65 s	0.017 μm – 0.410 μm
CAS (CAPS)	1 s	0.703 μm – 54 μm
AMS	30 s	NH_4, NO_3, SO_4, **Org**
PILS-IC	240 s	NH_4, NO_3, SO_4, **Na, Cl, Mg, MS, K, Ca**

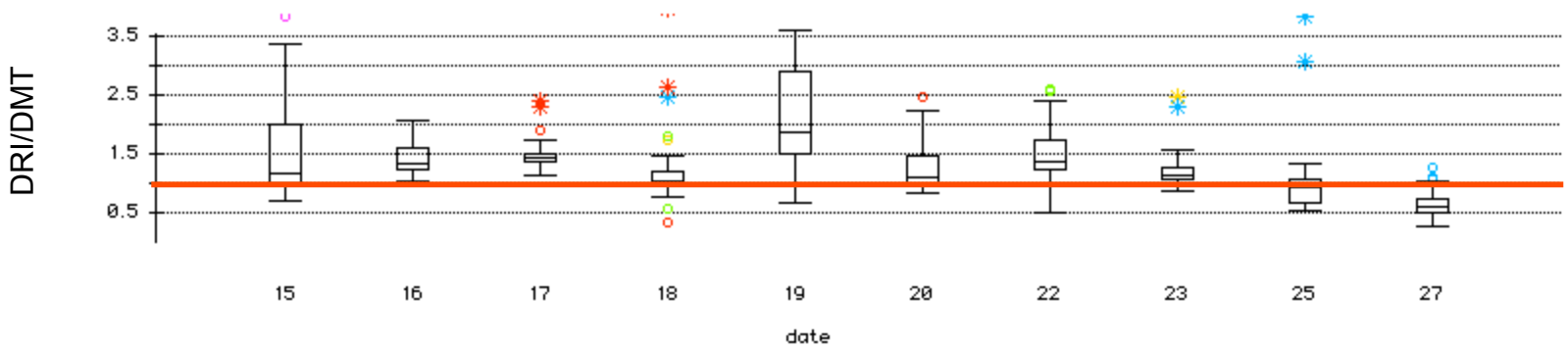
Data Coverage (DMA time base)

	DMA	*DRI CCN (0.08, 0.2)*	*DMT CCN (0.08, 0.2)*	*Coincident (0.08)*	*Coincident (0.20)*
Total marine	1709	1030, 1081	838, 1008	481	590
FT	161	107, 130	20, 37	11	34
MBL LWC>0.02	1015	471, 494	546, 638	233	280
MBL LWC<0.02	321	284, 274	172, 217	164	181
Organic layer [Org]>3.5μg cm^{-3} LWC<0.02	214	170, 185	100, 116	73	95

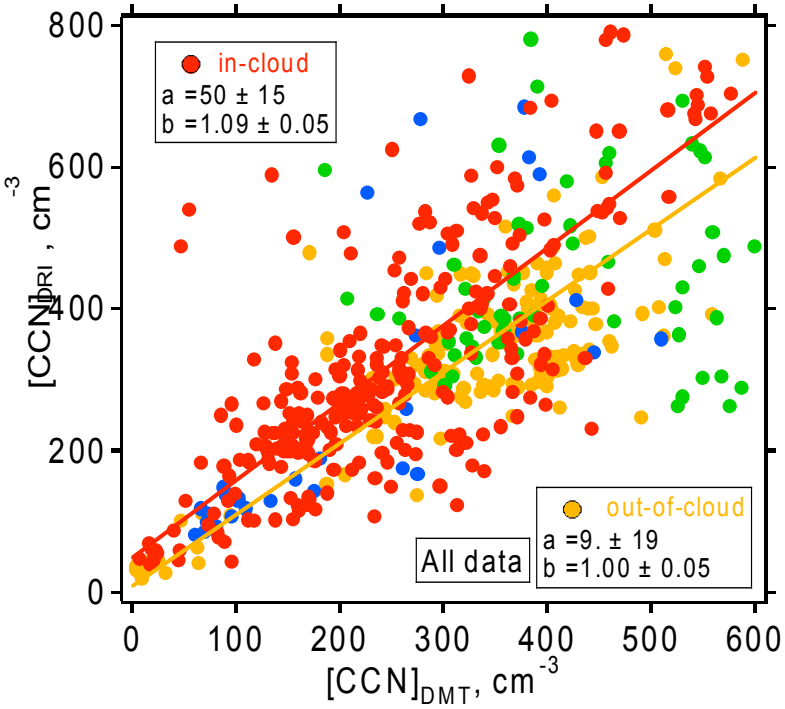
Comparison between DRI and DMT at ss=0.08%

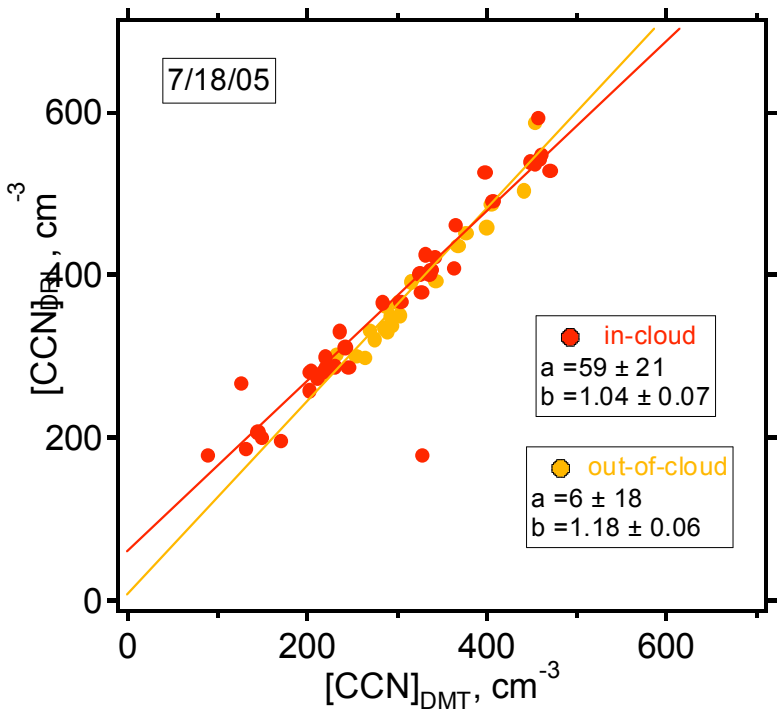


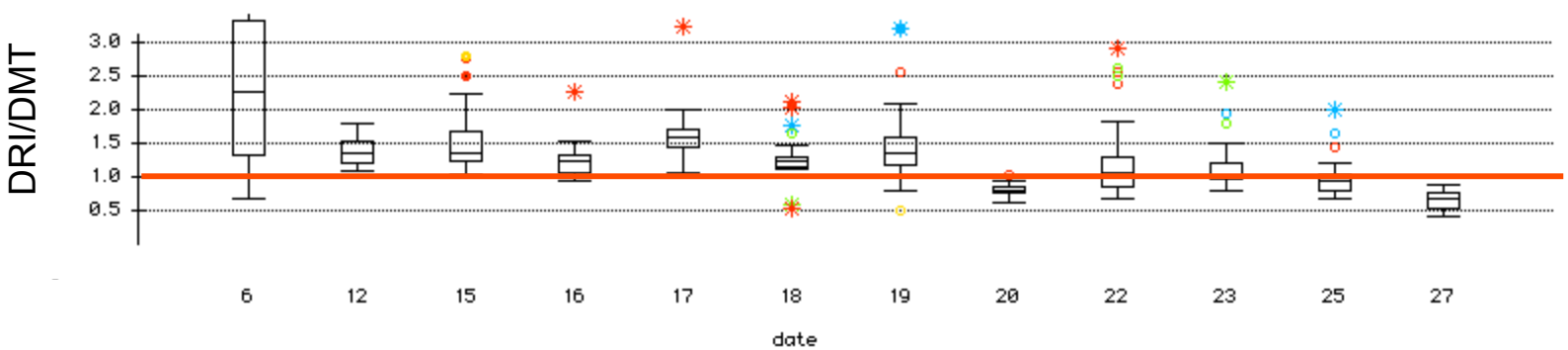




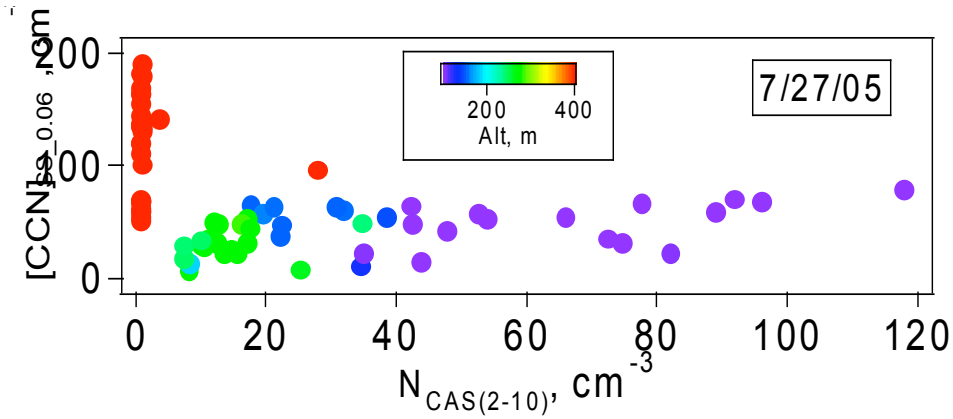
Comparison between DRI and DMT at ss=0.20%

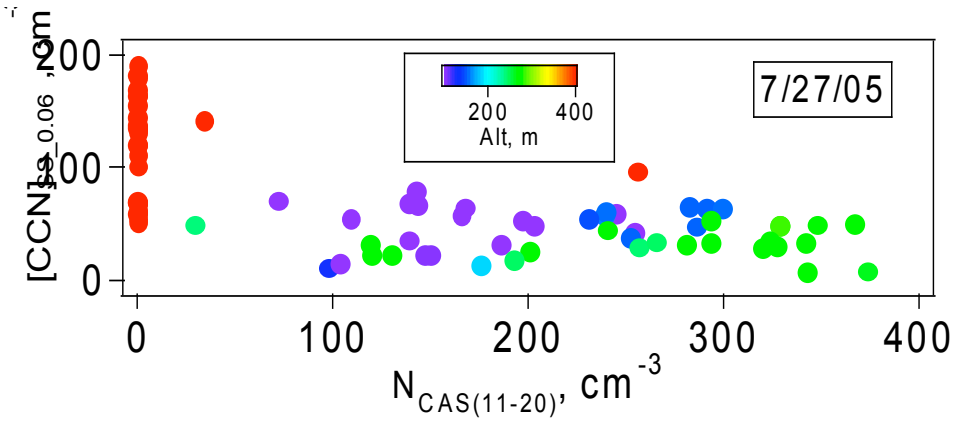




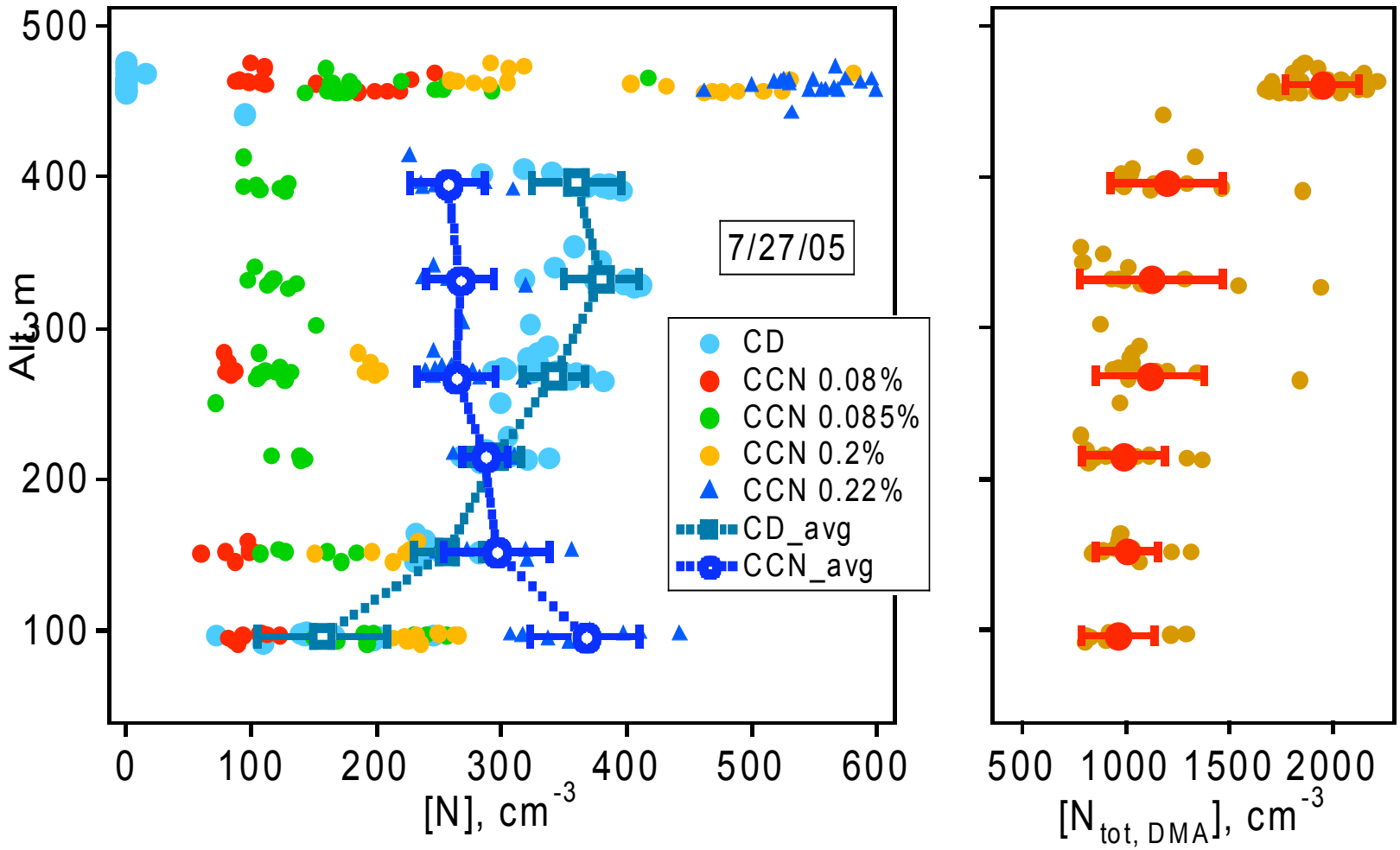


In-cloud CCN measurement showed no inlet effects related to cloud droplets

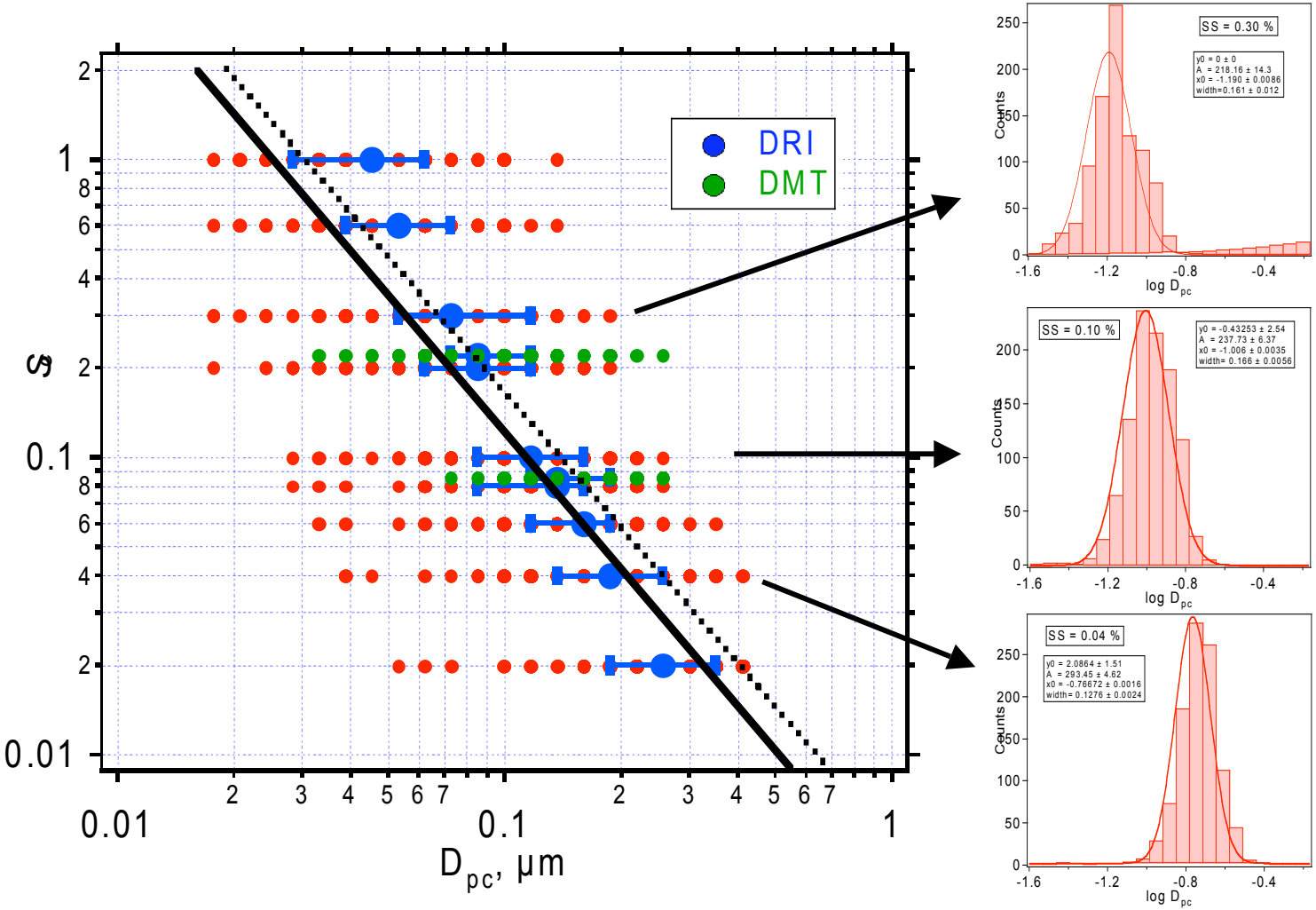




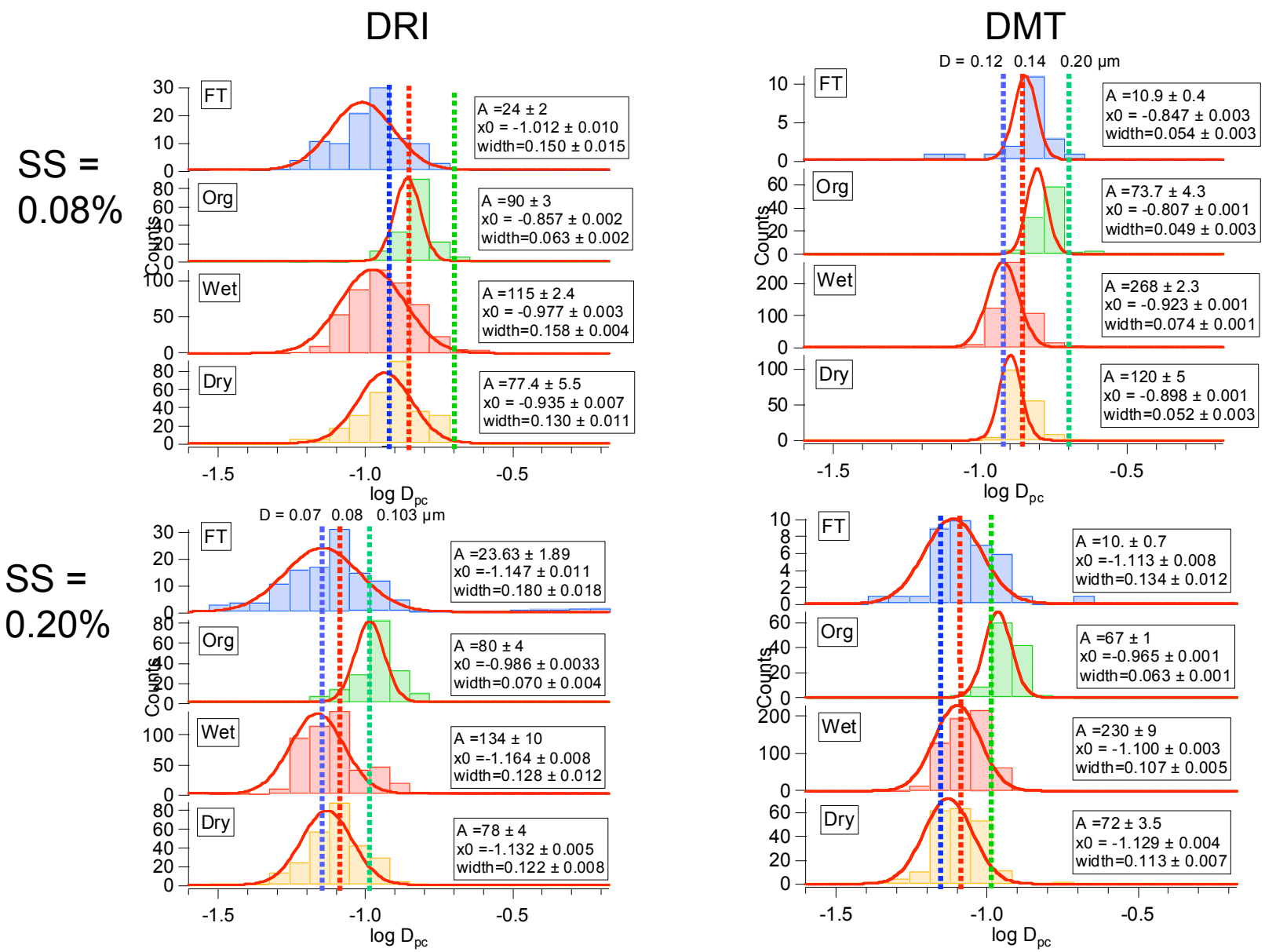
Vertical profiles of CCN, droplet, and DMA concentrations



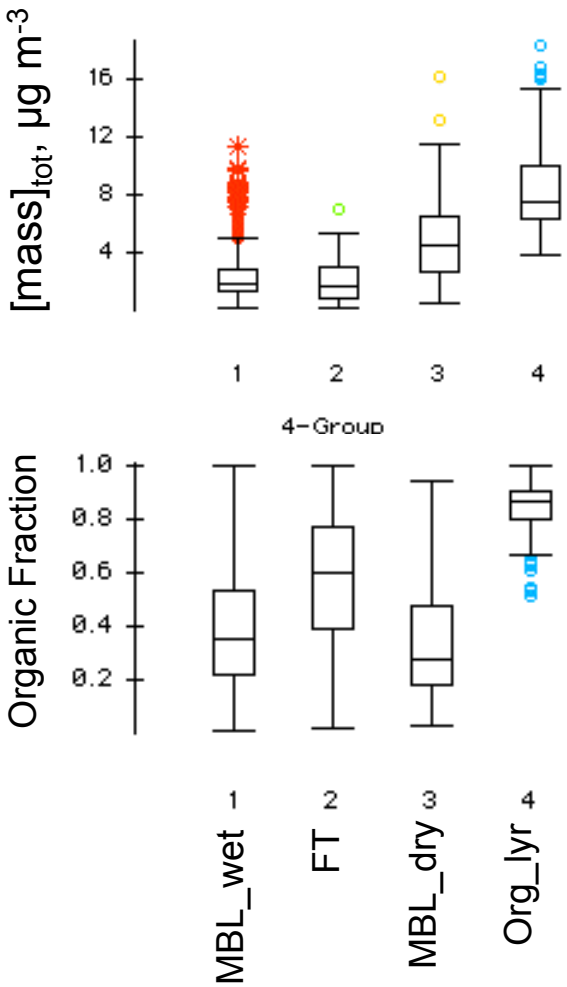
D_{pc} derived from CCN concentrations and DMA size distributions

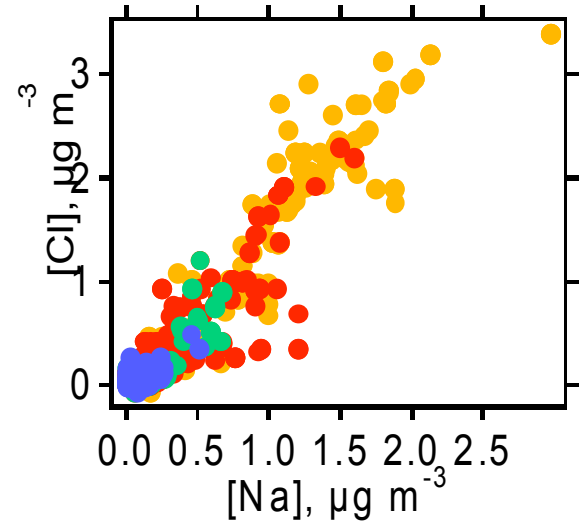


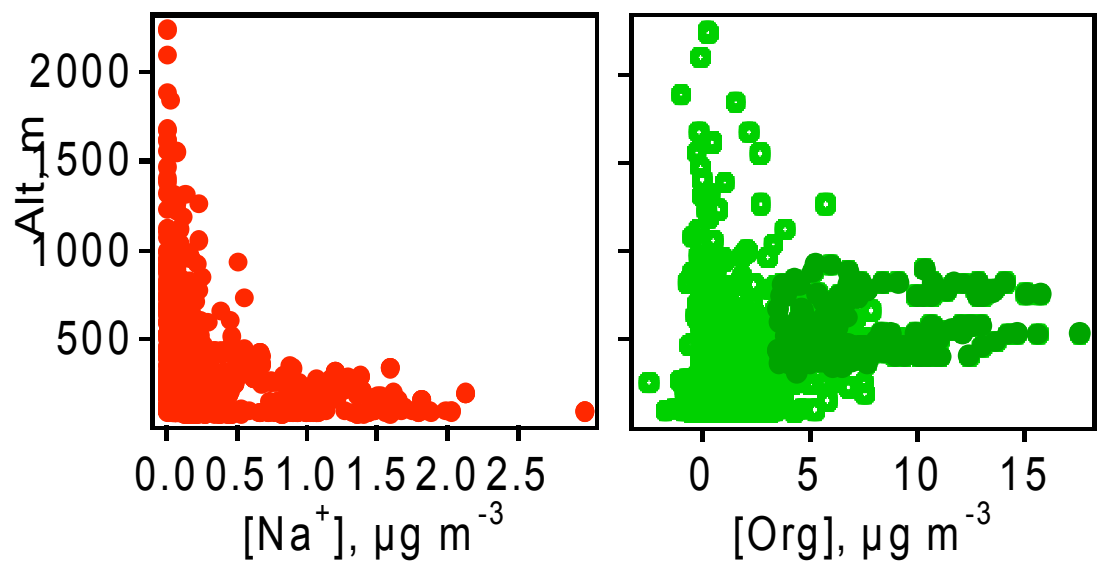
D_{pc} distributions of CCNs in the Four Environments



CCN Properties are Consistent with Aerosol Chemical Composition







Summary

- The DRI CCN spectrometer and the DMT CCN counter agreed on average to within 25%.
- In-cloud CCN measurement showed no inlet effects related to cloud droplets
- Observation of in-cloud low S_c CCN suggests a broad range of %SS in the cloud, resulting from cloud dynamics.
- MBL CCNs behaved like NaCl and $(NH_4)_2SO_4$.
- An organic aerosol layer above the cloud top influenced cloud microphysics by entrainment.
- For VOCALS: FIMS to improve D_{pc} precision; ToF-AMS to provide faster size resolved data; PTRMS to determine VOC and DMS; CO to infer aerosol sources.