Aerosol Size Distributions and Activation

measurements from the G-1

- Composition and size distribution vs. longitude
  - AMS and DMA
- Aerosol activation
  - Compare below cloud and interstitial size distributions.
  - PCASP and DMA
- Concluding remarks
  - What accounts for 200 – 400 nm particles not activated?

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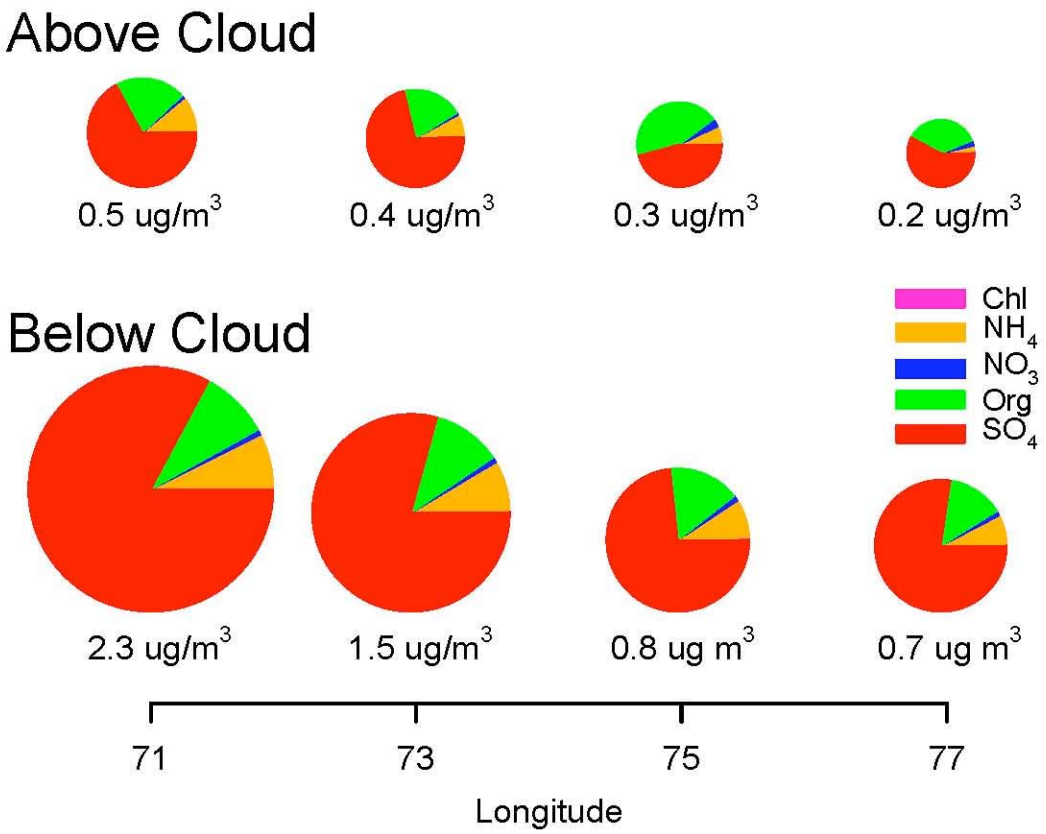
DMA: Jian Wang
CCN: Alex Laskin, Ryan Moffett, Jian Wang
PCASP: John Hubbe, Gunnar Senum, Stephen Springston

Aerosol Composition vs. Longitude

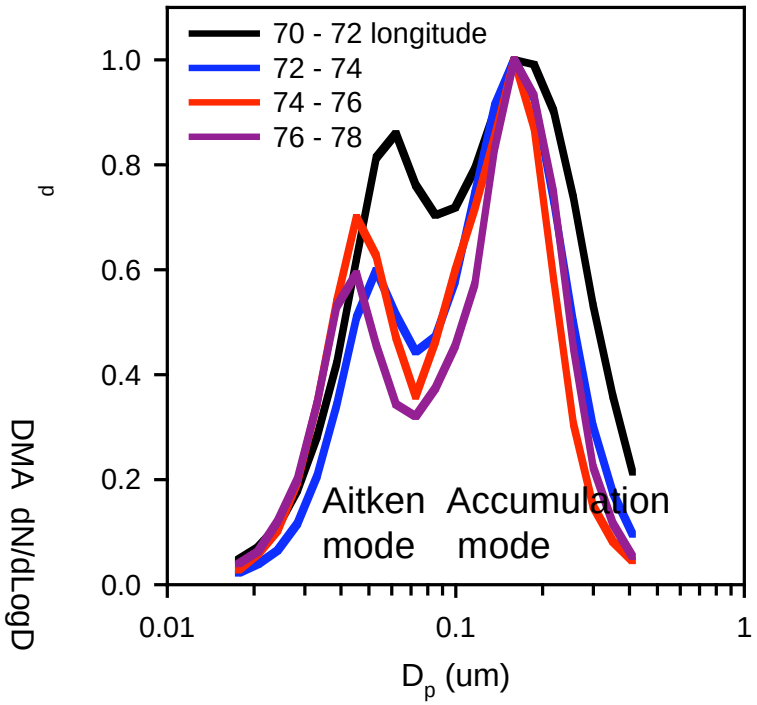


Below-cloud aerosol is ~ $(NH_4)_{0.5}H_{1.5}SO_4$ with 10-15% Organics

Primary change with distance from coast is dilution

DMA Spectra vs. Longitude

Below - Cloud



Above - Cloud

Bimodal with Hoppel minimum

Away from coast:

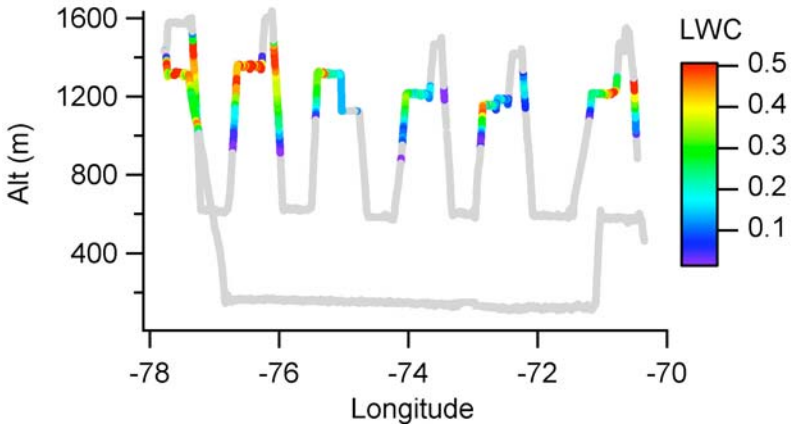
- Minimum moves to smaller D_p
- Indication of cloud processing?

~ Unimodal

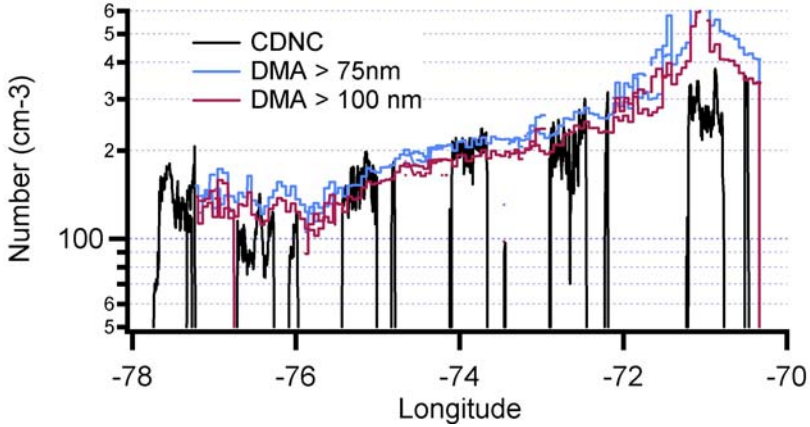
Statistics of pollutant layers obscures trends

LWC, CDNC, and Below-Cloud Aerosol

Flight track, 1028a



CDNC, below-cloud aerosol comparison

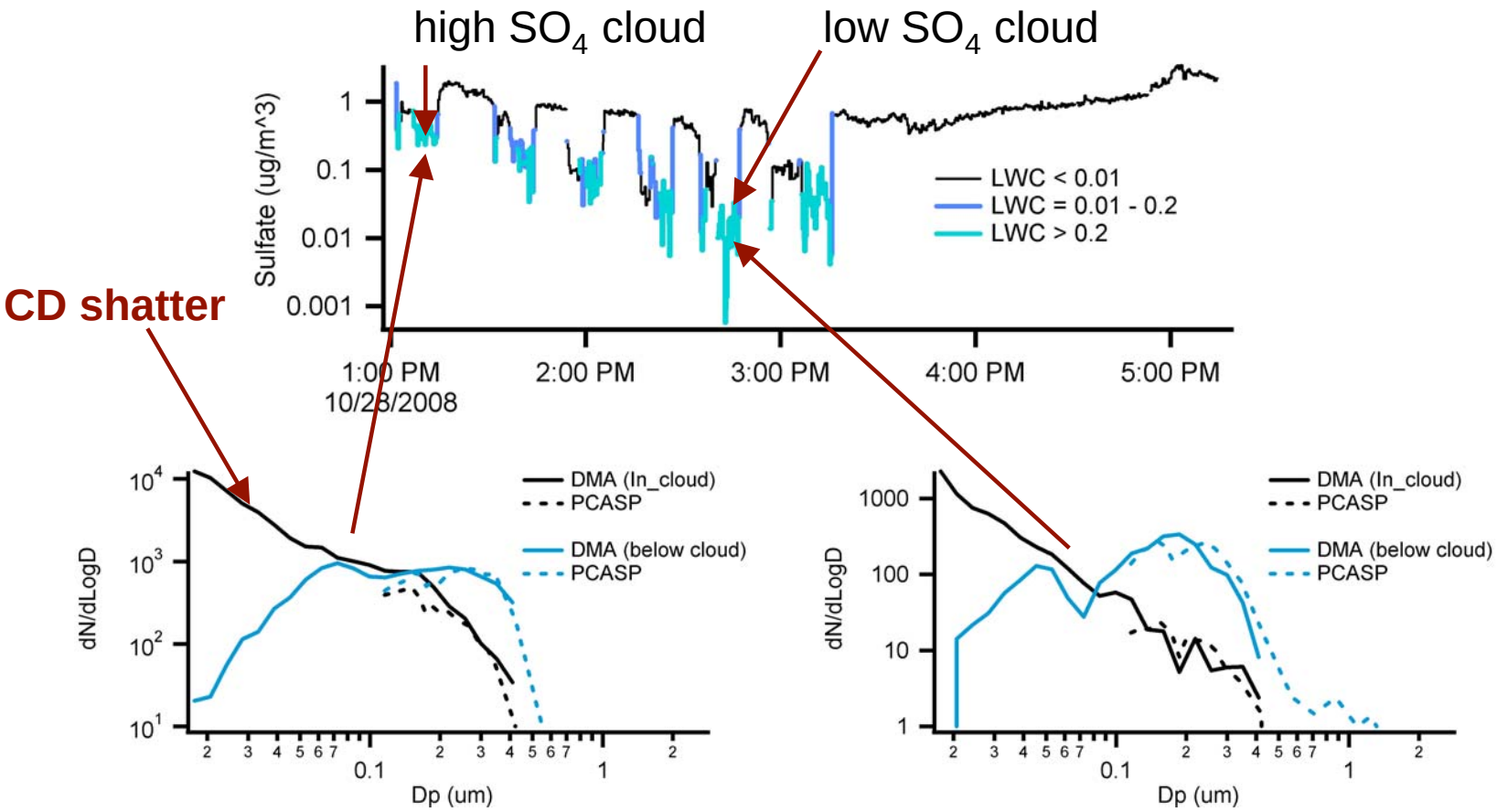


Below – cloud aerosol ~ same on inbound and outbound legs

CDNC ~ $N_{AEROSOL}$ > 75 or 100 nm

Depletion of CDNC from drizzle

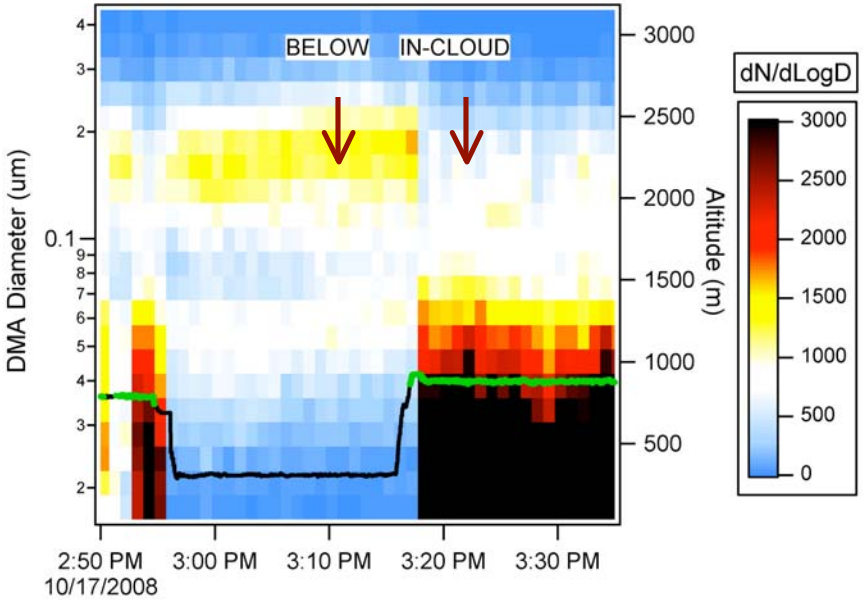
In-Cloud & Below-Cloud Aerosol Number Distributions

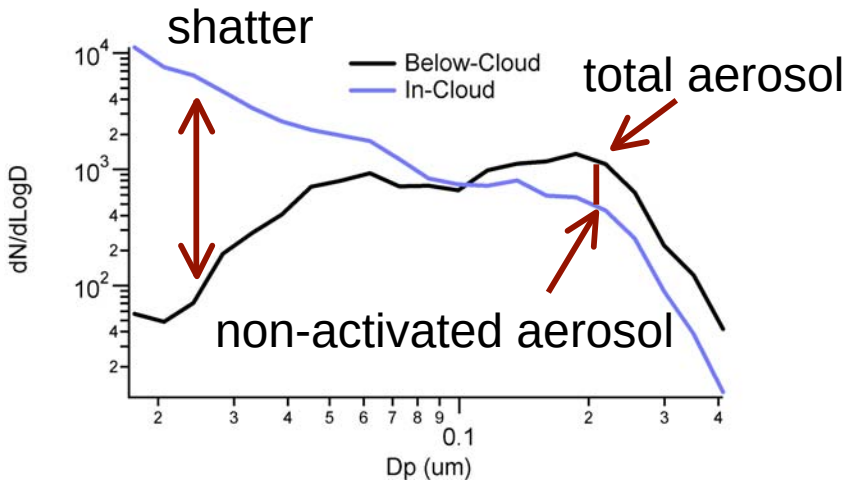


In both cases there are 200 – 400 nm particles that are not activated

Good agreement between PCASP and DMA

Another Example





- Below-cloud aerosol is actually below sampled cloud
- ~ 50% particles > 0.1 µm not activated
- Shatter is a factor at 100 nm. At 200 nm DMA size distribution looks "normal"

Concluding Remarks

- Aerosol is almost H_2SO_4
- From CCN and DMA: Ds ~ 80 nm at 0.2% SS
- Fraction of large particles (200 – 400nm) not activated can be 10's of percent
- Need to characterize un-activated fraction as a function of LWC, Reff, ...
- Need to examine contribution from mineral dust
- Need to obtain upper bound for interstitial aerosol derived from droplet shatter