

Processing of aerosol by shallow cumulus

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Scientific Objectives and Motivation

Science Objective:

1. Examine modification of aerosol properties due to cloud processing
 - Size distribution
 - Light scattering coefficient
2. Parcel model coupled with cloud model

RF17 cloud band study

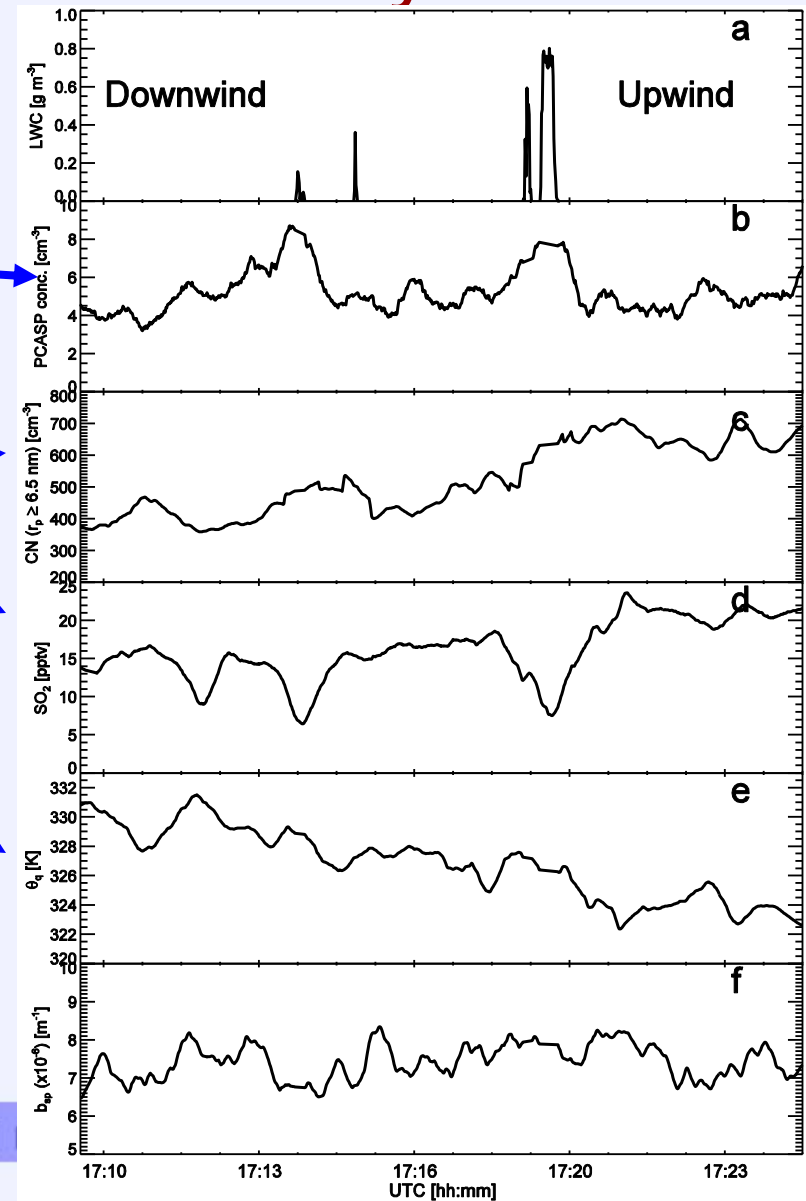
- Qualitative evidence of cloud processing?

- PCASP concentrations same on each side of cloud band

- CN and SO₂ concentrations decreased on downwind side of band compared to upwind
 - scavenging

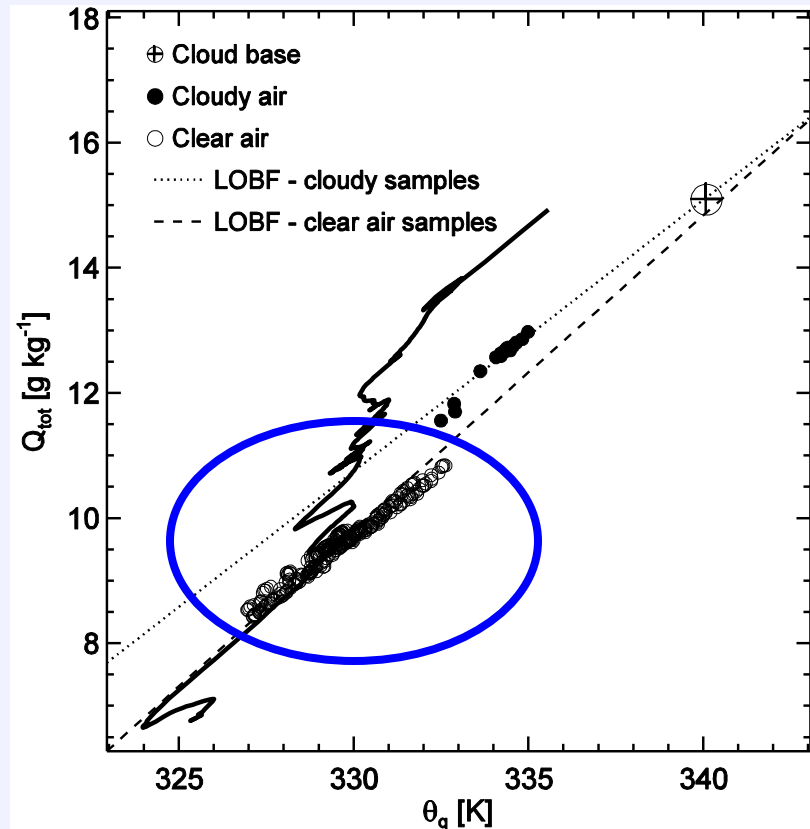
- Heat and moisture increased downwind of band due to convection

- What can be said about the aerosol scattering efficiency?



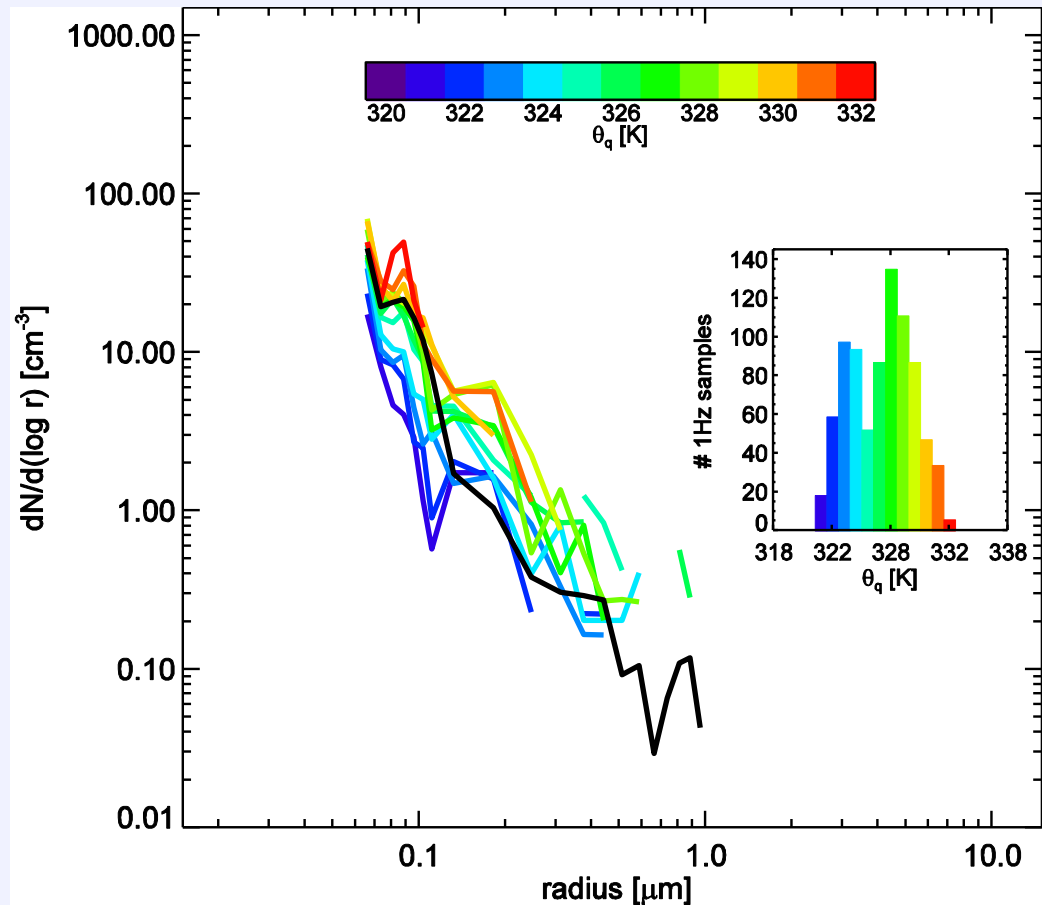
Using conserved tracers

- Some clear air samples contain air that has originated from cloud base
- Higher $\theta_q \Rightarrow$ Larger fraction of sub-cloud air
- How do aerosol properties vary with θ_q ?



Aerosol size distributions

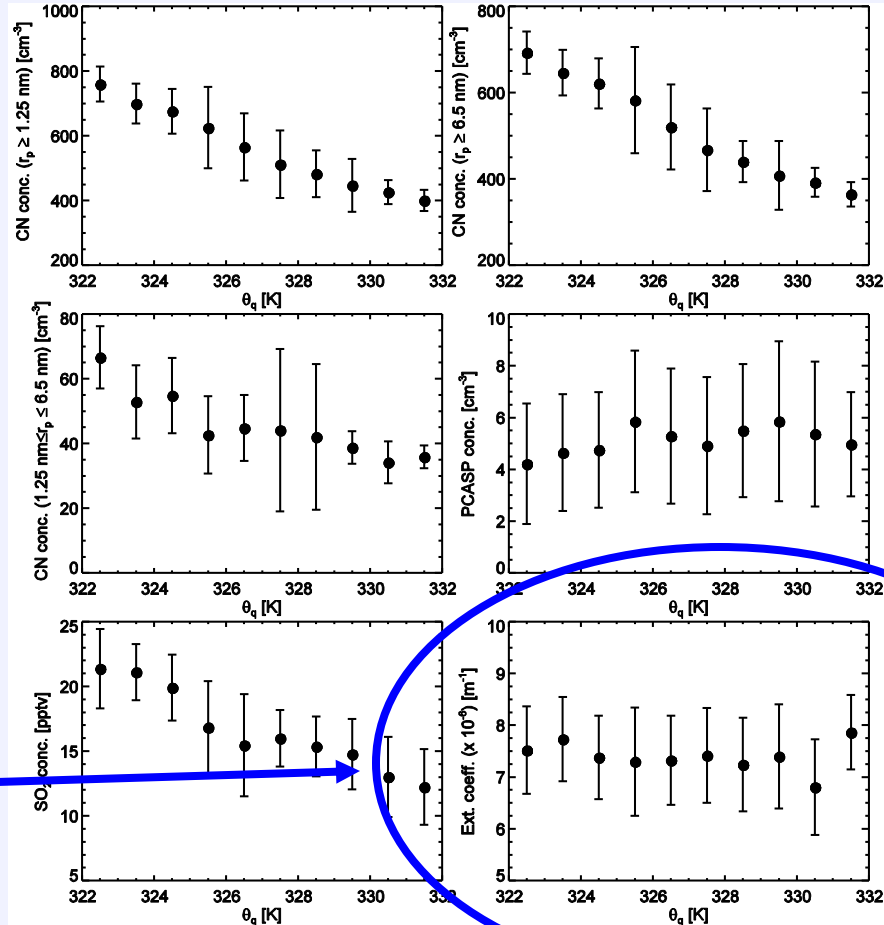
- Aerosol spectra exhibit stratification with increasing θ_q
- Identify larger values of θ_q as cloud-processed.
- Thermodynamically stratified aerosol differ from time-averaged spectra



θ_q stratified quantities

- CN and SO₂ concentrations decrease with increasing θ_q

- No corresponding increase of aerosol radiative properties



Future work

- Complete SO₂ data set now available
 - Look at cloud-layer circles
- Parcel model
 - Condensation
 - Coalescence
 - Sulfur chemistry
- ⇒
- Cloud model
 - trajectories
- Collaboration!