Session 6B Synthesis

Aerosol-Cloud-Drizzle Interactions

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Presentations:

Peter Daum: *Overview of G-1 measurements*
Bruce Albrecht: *Aerosol-cloud Interactions in coastal marine Sc - Overview of Twin Otter observations*
Xue Zheng: *Aerosol, cloud, drizzle data from Twin Otter flights.*
Dione Rossiter: *Cloud microphysics and drizzle fluxes*
Patrick Chuang: *What controls stratocumulus drizzle and entrainment*
Frederic Burnet: *Fast FSSP measurements*
Larry Kleinmann: *Aerosol size distributions and activation*
Gunnar Senum: *High speed cloud microphysics*
Peter Cook (M): *Examining cloud-scale processes using LEM, comparison with aircraft measurements*
Jefferson Snider: *CCN, Aerosol and Cloud Droplets*
Jorgen Jensen: *Impact of giant aerosols on drizzle formation*

Aerosol-Cloud

- Strong gradient in sub-cloud aerosol from coast to open ocean, mainly in number and not in composition
- Fairly low increases in [CCN] at supersaturation > 0.1 ~ 0.2%
- In some cases, activated fractions are very high, even in near-shore environment
- Sub-cloud aerosol correlates well with cloud drop concentration; above-cloud aerosol correlates poorly with cloud drop conc
- Hoppel minimum (associated with cloud processing of aerosol) is observed in many cases
- There was wide variability at Pt. Alpha in BL structure, which should be considered in looking at aerosol-cloud interactions

Cloud

- BAe-146 and C-130 cloud microphysical probes are exhibiting good agreement
- A possible homogeneous mixing event was observed (none was seen during DYCOMS-II)
- Large fluctuations in cloud properties over short length-scales (order 1 to 10 m) can be seen

Cloud-Drizzle

- Evidence of threshold behavior of auto-conversion (G-1)
- At Pt. Alpha, drizzle is:
  - generally not well-developed, and very light
  - is usually maximum at cloud top, with a few cases with significant cloud base flux
- Cloud top sedimentation-entrainment feedback may be an aerosol indirect effect independent of cloud base drizzle flux

Aerosol-Cloud-Drizzle

- LWP is well-correlated with drizzle @ Point Alpha
- Some initial hints that drizzle may be anti-correlated with aerosol @ Point Alpha
- Initial evidence that giant (sea-salt) aerosol may affect drizzle production (but likely not in POC regions)
- Model predicts differences in cloud microphysical and radiative properties between 72W and 79W. These properties are predicted to be sensitive to drizzle, surface energy fluxes and aerosol.

Looking forward...

- Must move from qualitative to quantitative description
- Macrophysical vs microphysical variable controls of drizzle
- Teasing this apart requires:
  - that meteorology and aerosol be uncorrelated
  - (hopefully) a wide dynamic range in these variables. Best achieved by combining data from all platforms
  - it is crucial to evaluate both of these factors
- Integration of snapshots to help build a time-continuous story (movie from photos). This requires:
  - integration of aircraft data (pre-requisite is self-consistent measurements)
  - closely working with models at multiple scales