Precip Initiation Studies

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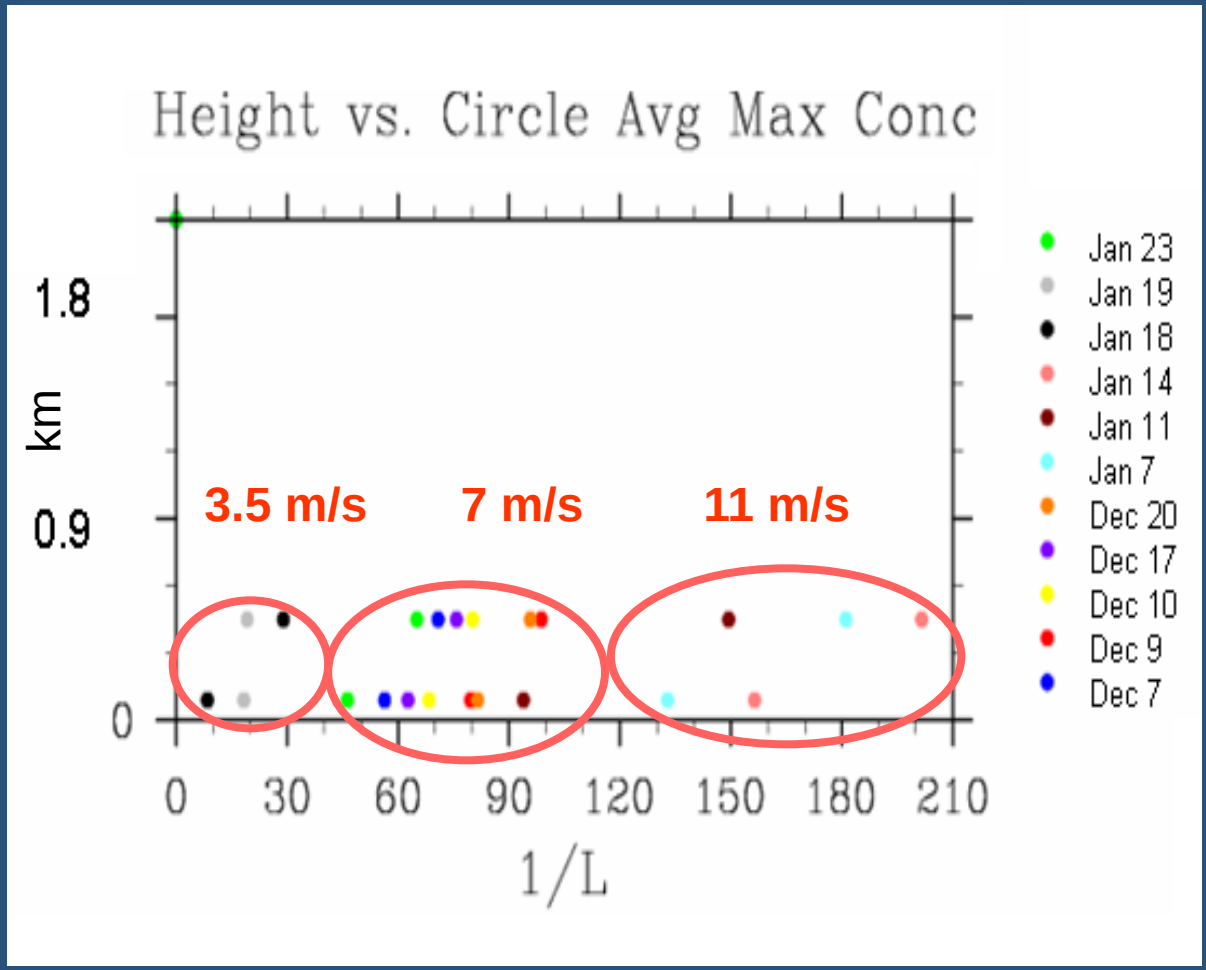
FSSP Data Analysis of Giant Aerosol

- Average FSSP concentration from “circles”
- Appearance of 3 regimes
- Consistent with near surface wind speed



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Preliminary Radar Analysis

- 6 days identified to investigate
  - 10 Dec, 20 Dec, 11 Jan, 14 Jan, 18 Jan, & 23 Jan

	10 Dec	20 Dec	11 Jan	14 Jan	18 Jan	23 Jan
Max dBZ	-5 to 5	0 to 5	-5 to 0	15 to 20	0 to 5	0 to 5
Lifetime	Long (?)	30-40 min (?)	15 -30 min	Short (10 min)	Long	Long (~ 30 min)

- High GA concentration → high initial reflectivity, short lifetime, & high maximum reflectivity

- Looking for “anomalous” GA behavior

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Future Work

- 3 of these appear to have “anomalous” GA behavior
  - 10 Dec, 20 Dec, 11 Jan
  - 10 Dec → variation in GA throughout the day
- More quantitative analysis of radar data
  - Cloud evolution, lifetime, initial reflectivity, ZDR
- Pinpoint “anomalous” days to investigate
- Survey environmental characteristics
- Cloud modeling

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Influence of Entrainment-- obs

- Focus on precip initiation in smaller trade wind cu (not lines or deeper clouds), and perform analysis wrt shedding thermal model

- Take statistical approach to representing features of "typical" cloud behavior on each day of interest

  - Drop size distribution evolution
  - Relating to environmental characteristics
  - Radar echo evolution

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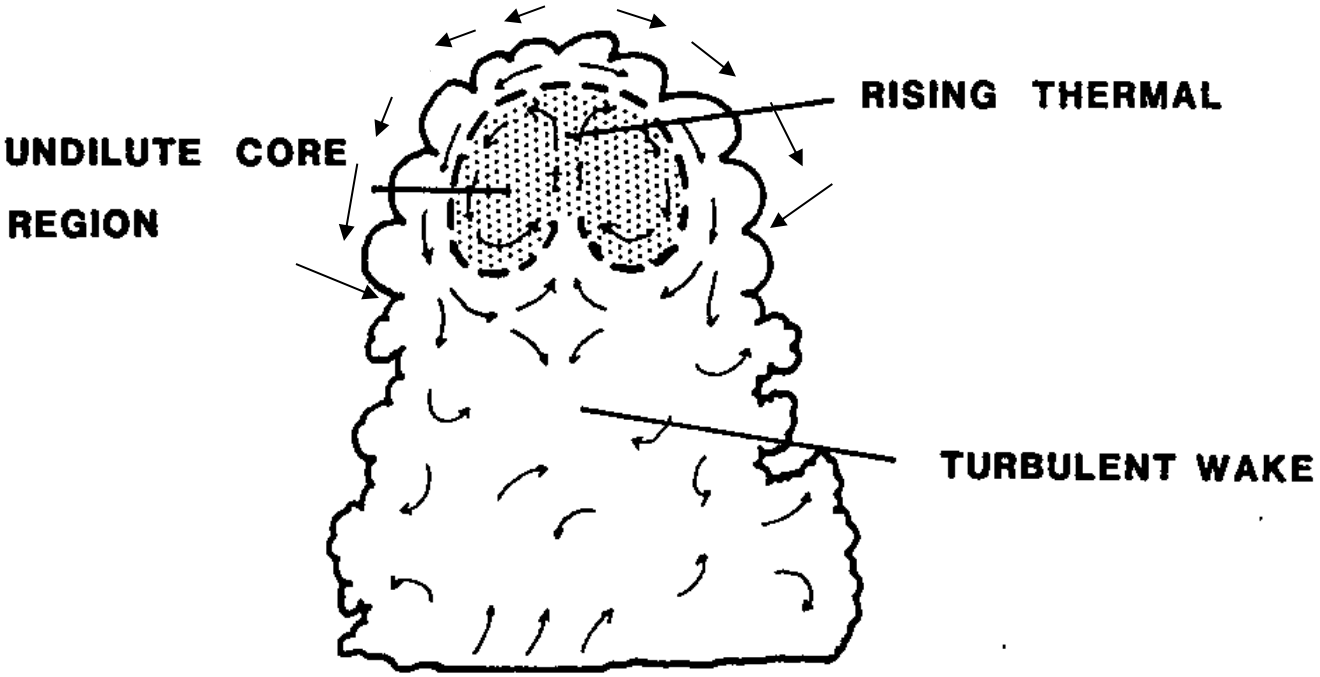

adapted from Blyth, Cooper, Jensen (1988)

Potential Cases

- Flight days were selected based upon:
  - Sampling smaller trade wind cumulus
  - Differences in environmental soundings
  - Differences in precipitation amounts

- 10 Dec vs. 20 Dec (RF04,09)
  - Similar environmental soundings (drier) but less precip on 20 Dec (1 L^{-1} vs. 0.03 L^{-1} on 2D-P)

- 16 Dec. vs. 20 Dec (RF06, 09)
  - Different environmental soundings (16^{th}-- drier, 20^{th} more moist) but similar amounts of precip (0.03 L^{-1} on 2D-P)

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Entrainment-- modeling

- Model cloud “typical” of each day of interest, at high spatial resolution
- Investigate effects of entrainment and mixing on drop size distributions and precip evolution
  - run parcel model along trajs through simulated cloud
  - extend calcs to coalescence
- Compare with clouds in drier environments-- New Mexico cumulus

Lasher-Trapp et al. (2005)

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Workshop Collaborators

- Alan Blyth, Jason Lowenstein, Justin Peters (Univ. of Leeds)
  - *Data analysis, entrainment, numerical modeling of DSD along trajectories*
- Patrick Chuang and Jen Small (UC Santa Cruz)
  - *Analysis of large drop data from PDI (phase Doppler interferometer) wrt thermal circulation*
- Charlie Knight (NCAR)
  - *Modeling of giant aerosol growth in RICO clouds and comparison to ZDR radar echo evolution*
- Bjorn Stevens (UCLA)
  - *Hierarchy of LES*

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