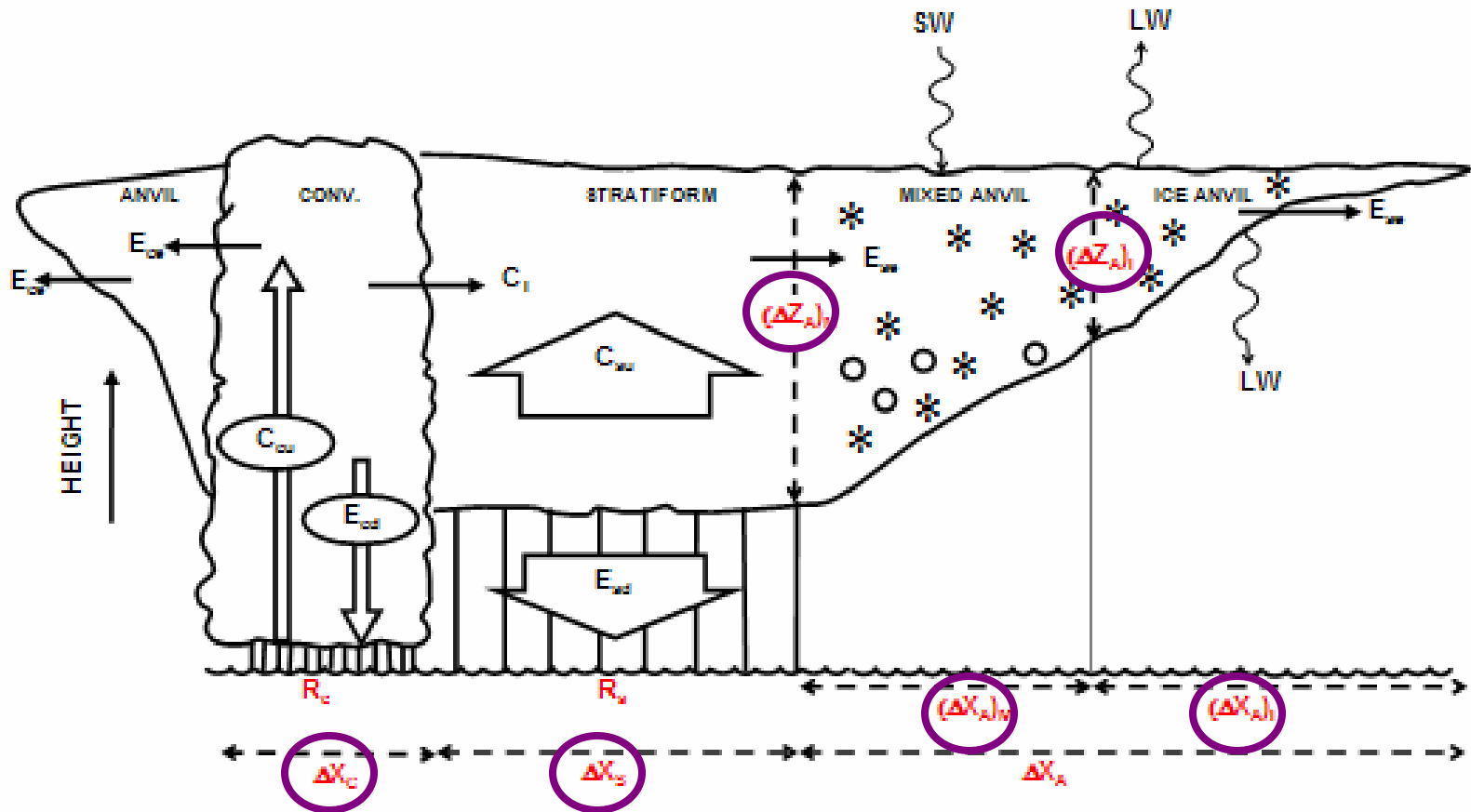


# Anvil Characteristics as seen by C-POL during TWP-ICE

Kaycee Frederick and Courtney Schumacher  
Texas A&M University

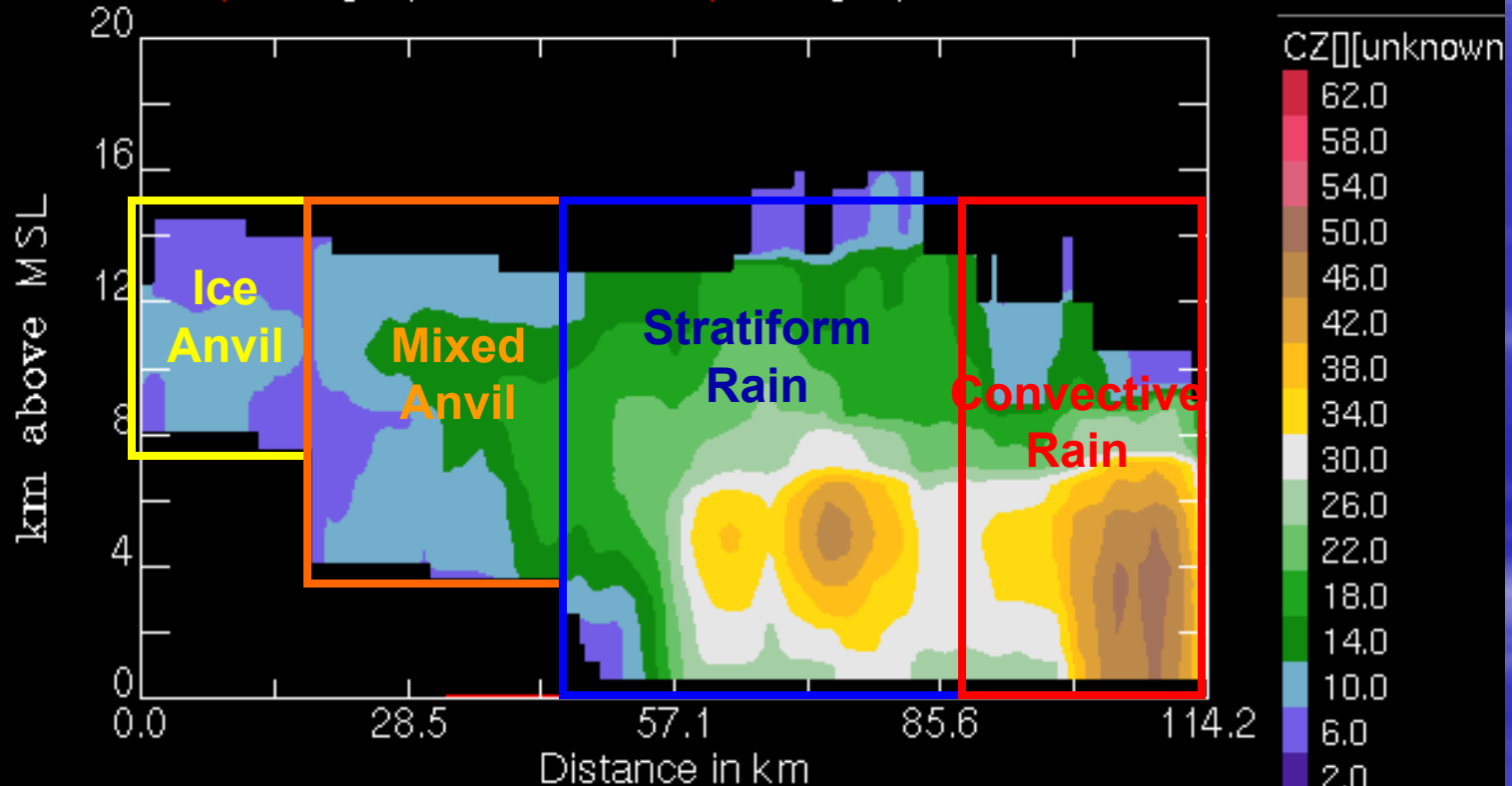
# MCS water budget

(Modified from Houze et al. 1980)

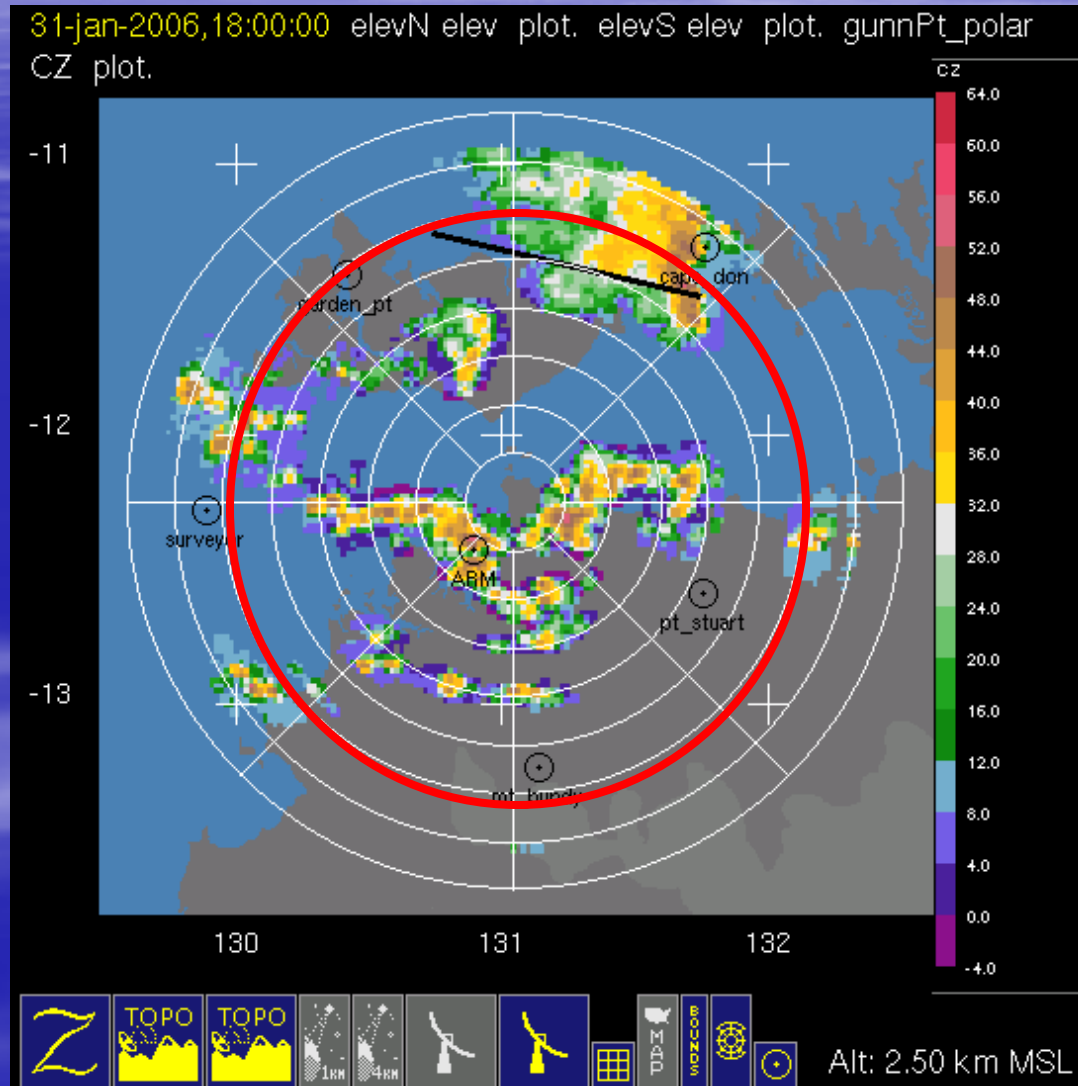


# C-POL vertical x-sect

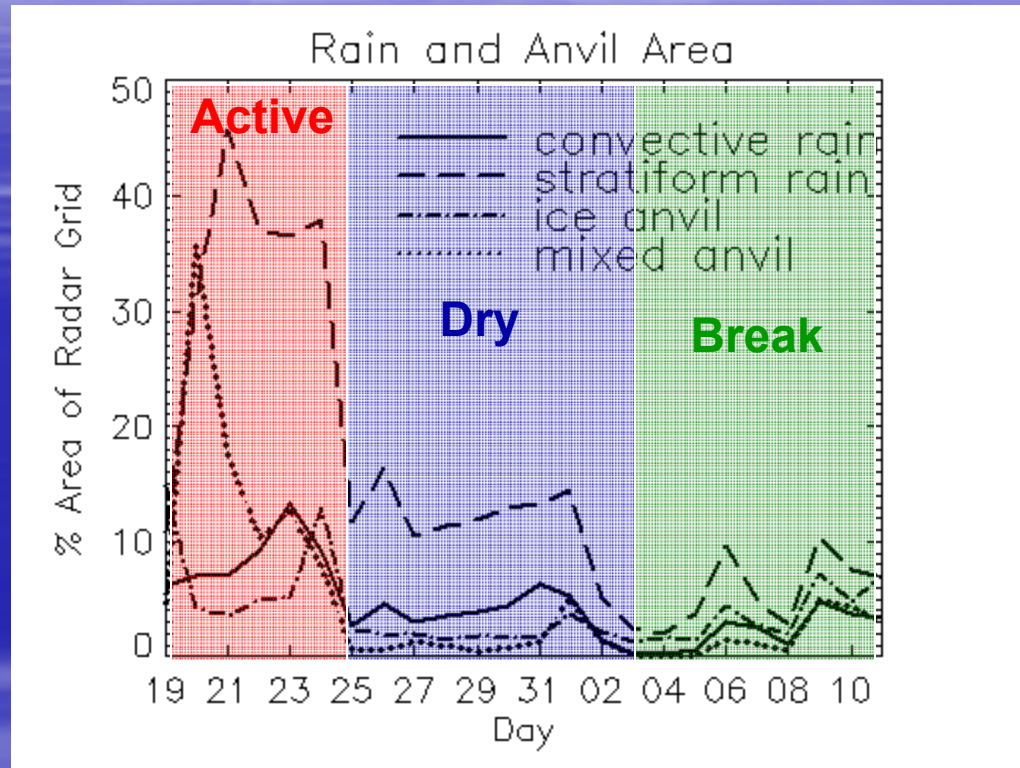
31-jan-2006,18:00:00 Planar cross-section plot. Contour of CZ using: gunnPt\_polar. Contour of **topo** using: topoN. Contour of **topo** using: topoS.



# C-POL domain

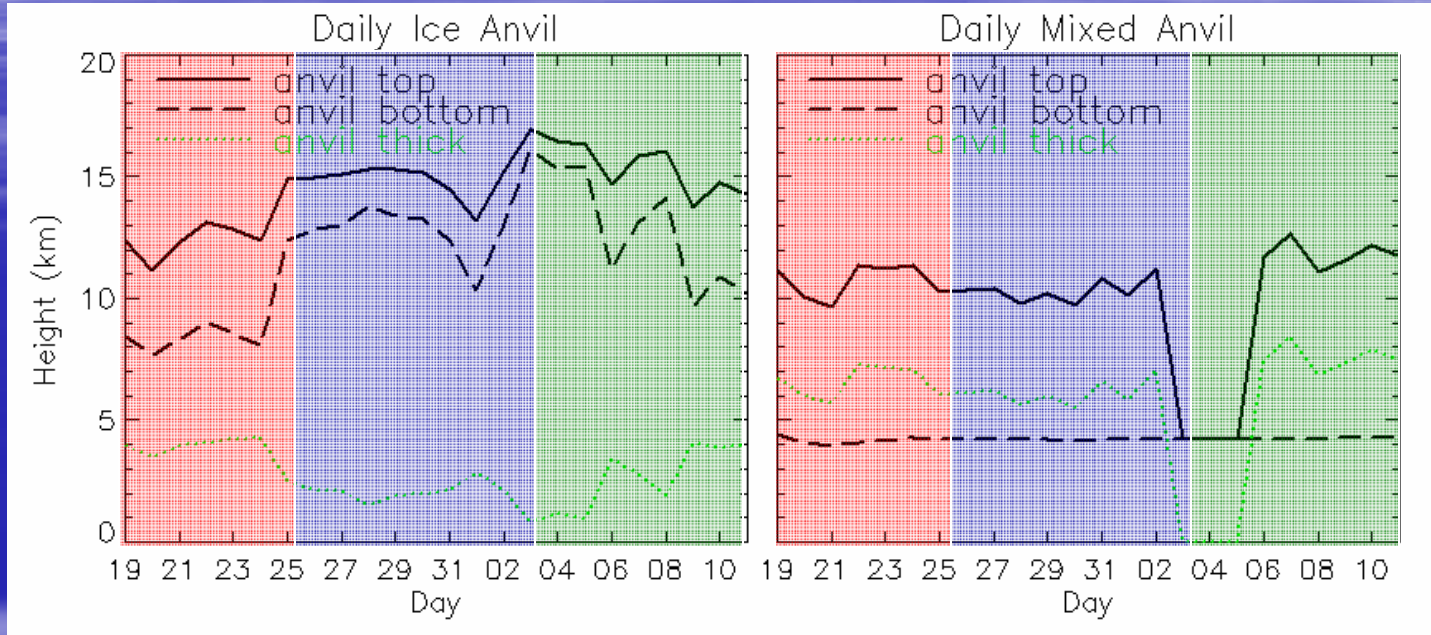


# Experiment averages



Area (%)	Ice	Mixed	Convective	Stratiform	Total
Experiment	4.0	4.8	4.4	14.9	28.2
Active	7.6	15.6	8.6	33.2	65.0
Dry	2.1	1.3	3.9	11.9	19.3
Break	3.6	1.7	2.2	5.6	13.0

# Experiment averages



Top (km)	Ice	Mixed
Experiment	14.5	10.9
Active	12.4	10.8
Dry	14.9	10.3
Break	15.5	11.8

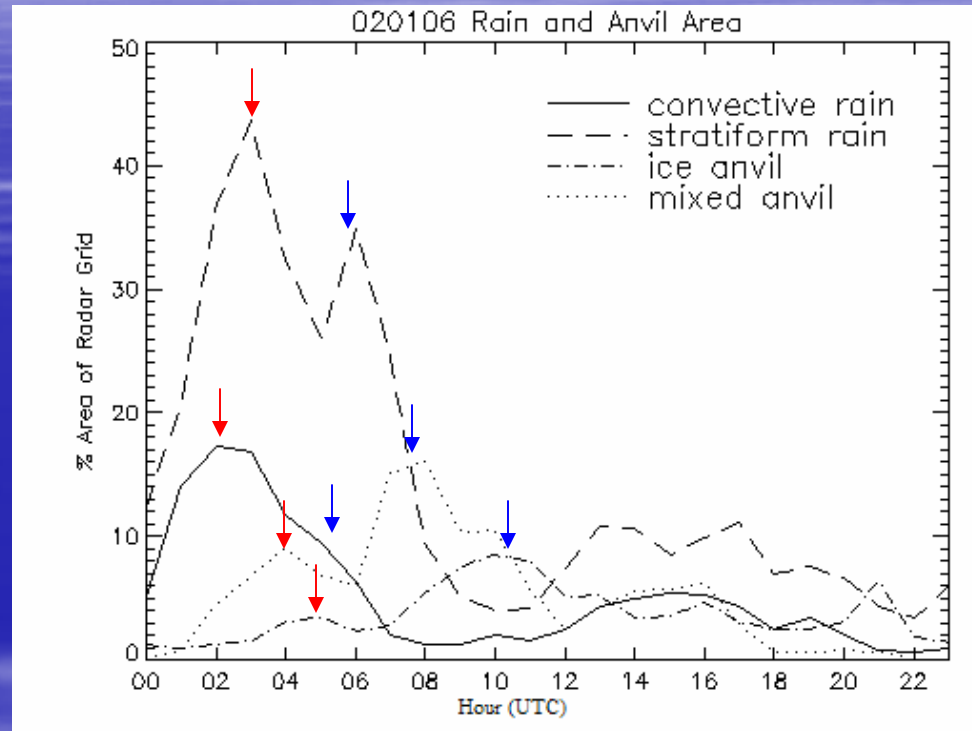
Thickness (km)	Ice	Mixed
Experiment	2.8	6.7
Active	4.0	6.6
Dry	2.1	6.1
Break	2.5	7.6

# 1 February 2006

See QuickTime movie file “courtney-060201.mov”

QuickTime™ and a  
Video decompressor  
are needed to see this picture.

# 1 February 2006

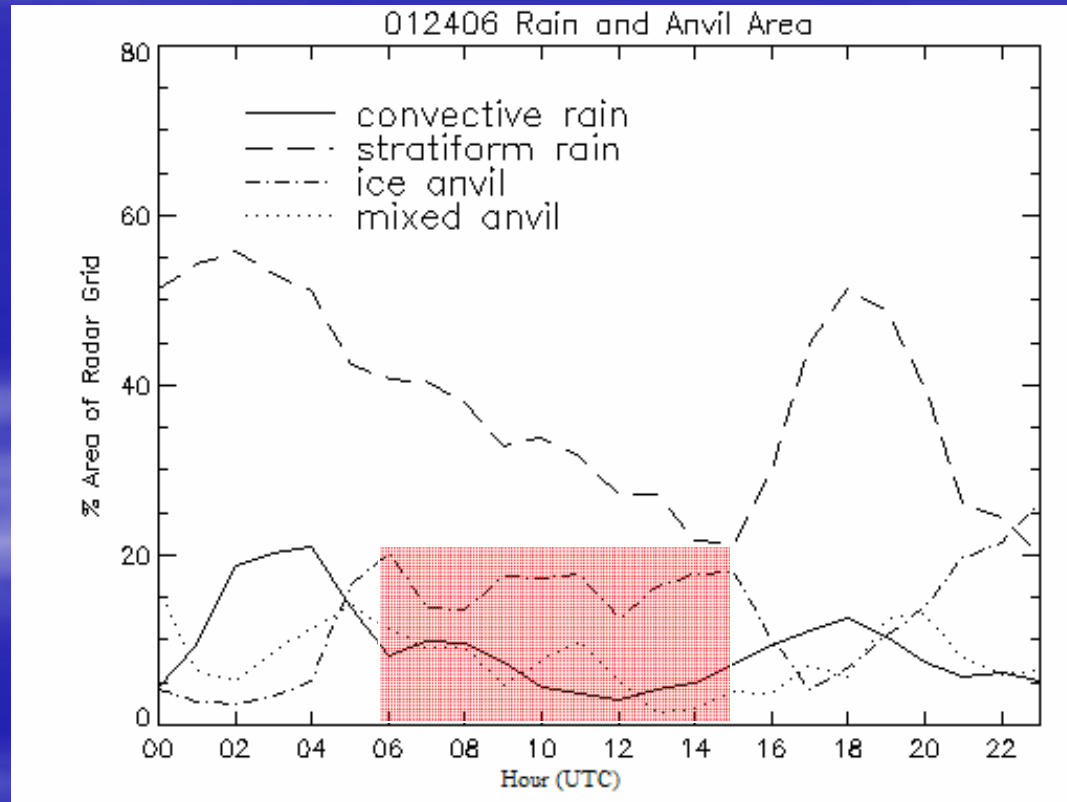


- Mixed anvil lags 1-2 hr behind stratiform rain peak
- Ice anvil lags 1-3 hr behind mixed anvil peak
- 8 out of 12 MCSs followed the pattern above



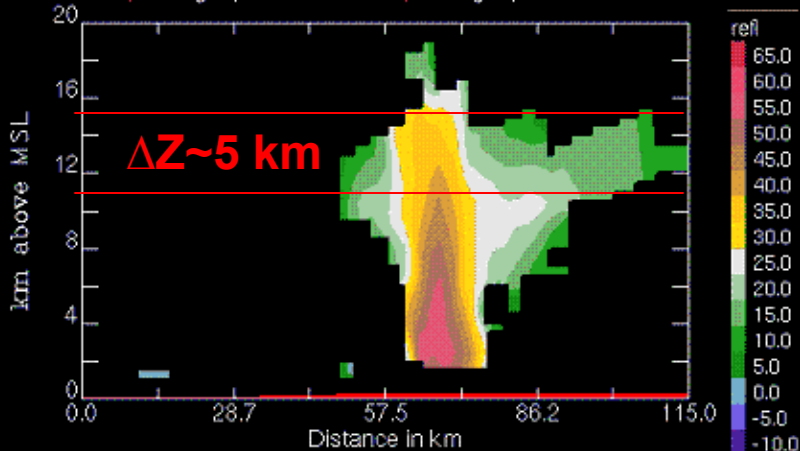
# Anvil longevity

- Anvil typically lasts 4-10 hrs after initial convective rain area peak

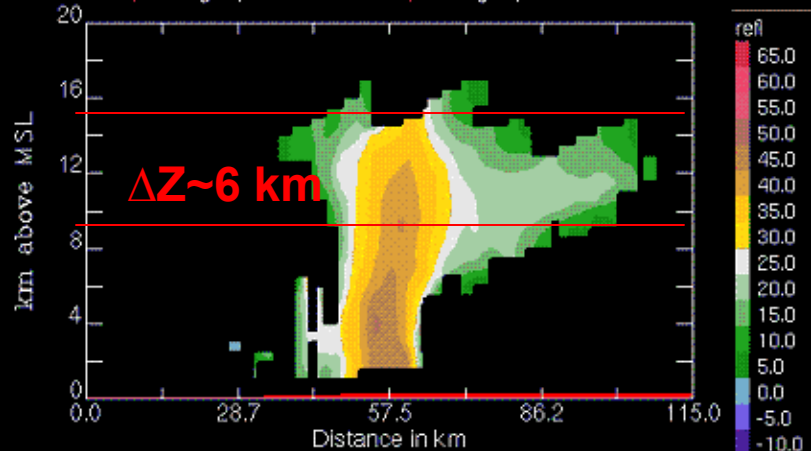


# Anvil sedimentation

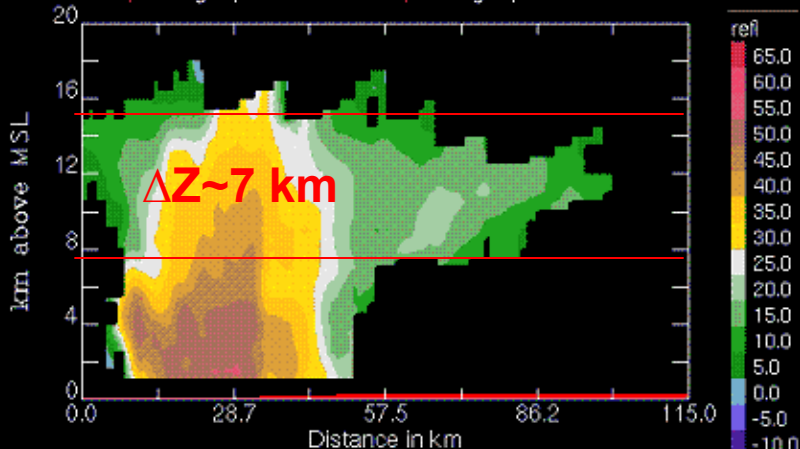
10-feb-2006,11:30:00 Planar cross-section plot. Contour of refl using: gunnPt\_pid.  
Contour of **topg** using: topoN. Contour of **topo** using: topoS.



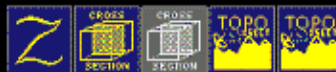
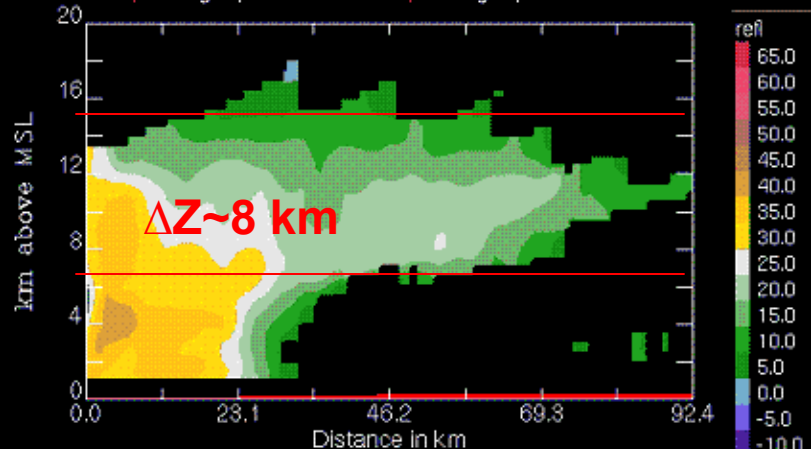
10-feb-2006,12:00:00 Planar cross-section plot. Contour of refl using: gunnPt\_pid.  
Contour of **topg** using: topoN. Contour of **topo** using: topoS.



10-feb-2006,12:30:00 Planar cross-section plot. Contour of refl using: gunnPt\_pid.  
Contour of **topg** using: topoN. Contour of **topo** using: topoS.



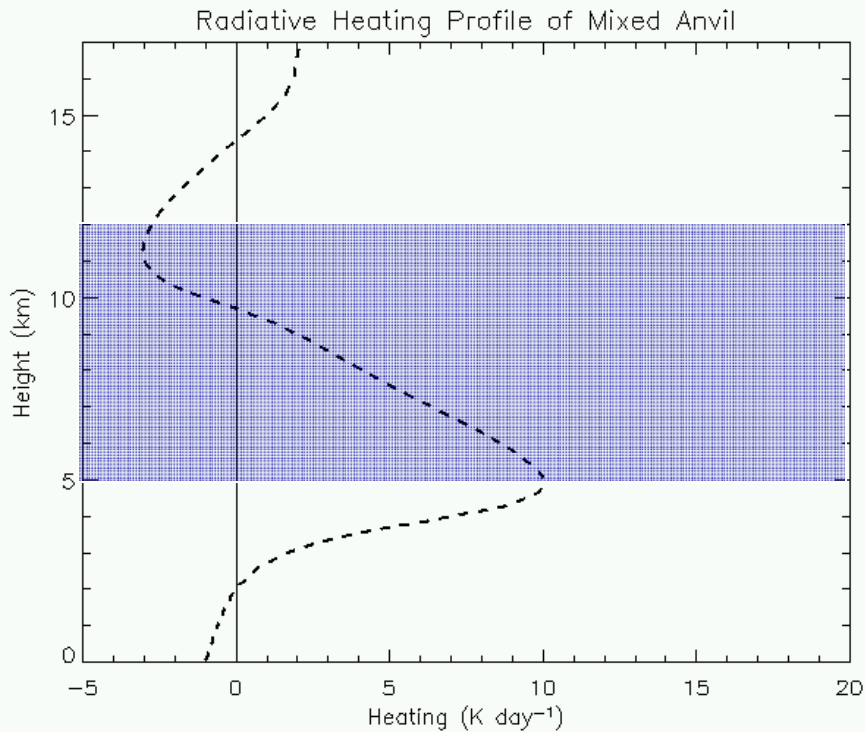
10-feb-2006,13:00:00 Planar cross-section plot. Contour of refl using: gunnPt\_pid.  
Contour of **topg** using: topoN. Contour of **topo** using: topoS.



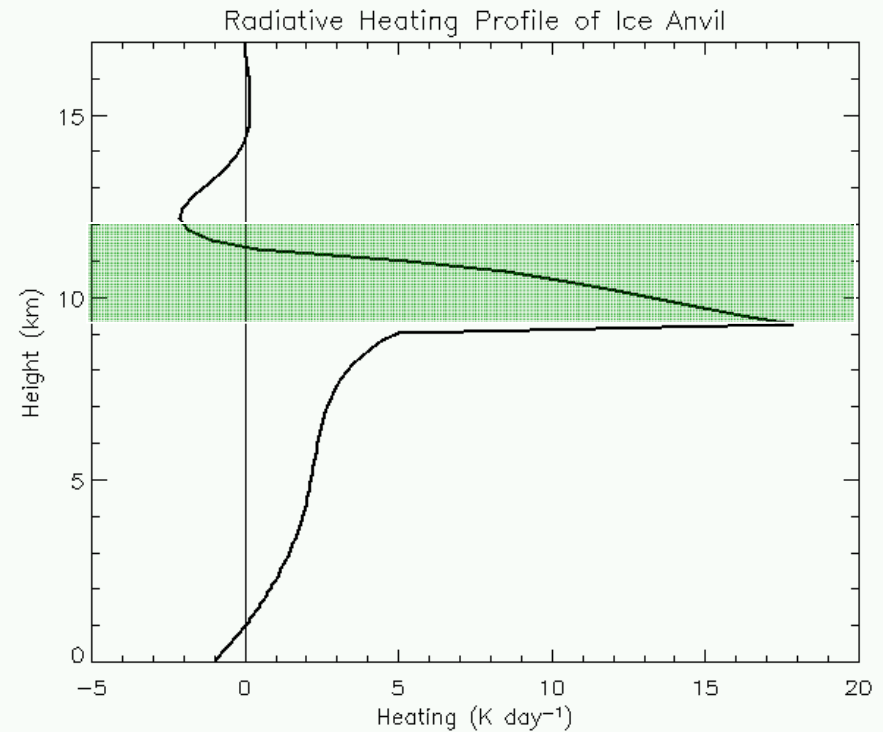
# Radiative heating profiles

- Webster and Stephens (1980)

## Mixed Anvil



## Ice Anvil



# Radiative heating profiles

- Idealized profiles based on Webster and Stephens (1980)

## Dry and break regimes:

Very similar

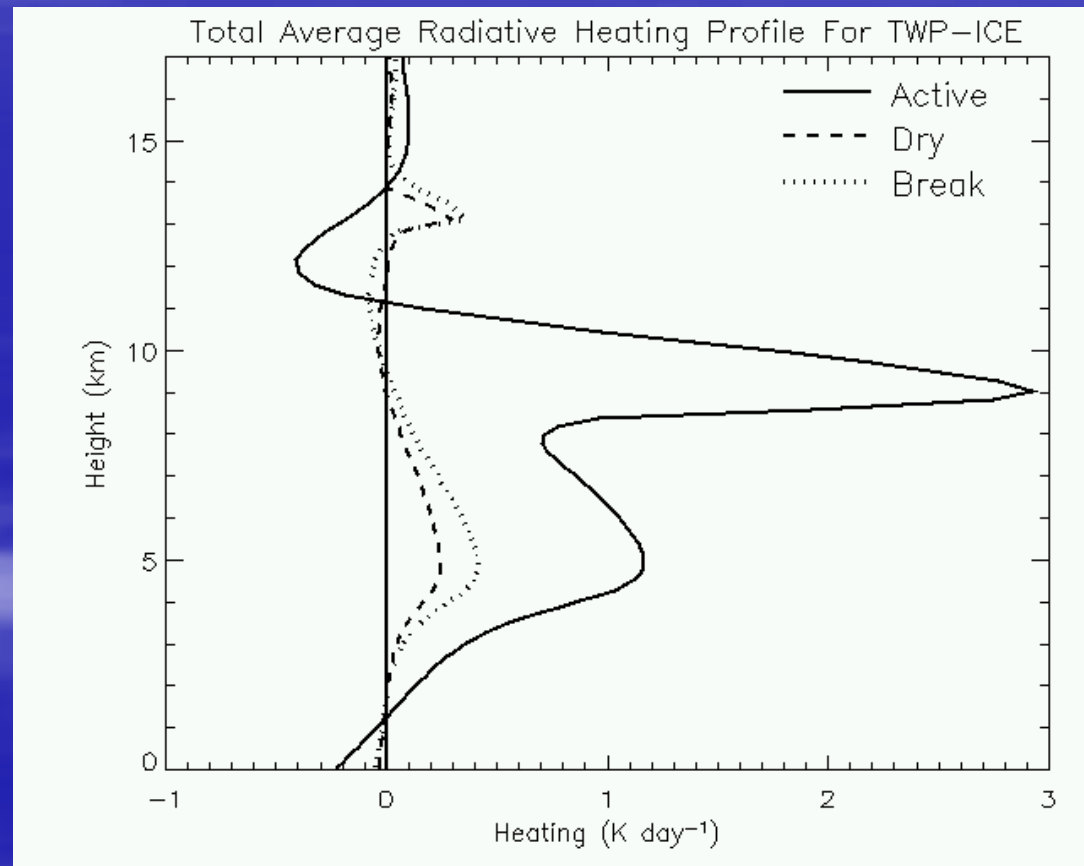
Heating peaks  $< 0.5 \text{ K day}^{-1}$

## Active regime:

Max heating of  $3^\circ \text{ K day}^{-1}$  at 9 km  
and  $1.2^\circ \text{ K day}^{-1}$  at 5 km

Max cooling of  $0.5^\circ \text{ K day}^{-1}$  at 12 km

Active regime leads to greater  
large-scale response than dry  
and break regimes.



# Conclusions

- Ice and mixed anvil observable by C-POL covered ~10% of the radar domain, while rain covered ~20%
- Convective rain area peaks first, followed by peaks in stratiform rain area, mixed anvil, and ice anvil (with lags of 1-3 h for each peak)
- Anvil typically lasted 4-10 h after initial convective rain area peak
- As ice anvil coverage increases, it becomes thicker and has lower heights (most likely due to sedimentation)
- Radiative heating peaks during the active regime were 1 K day<sup>-1</sup> at mid levels and 3 K day<sup>-1</sup> at upper levels