Heating Profiles Derived From Cm-wavelength Radar During TWP-ICE

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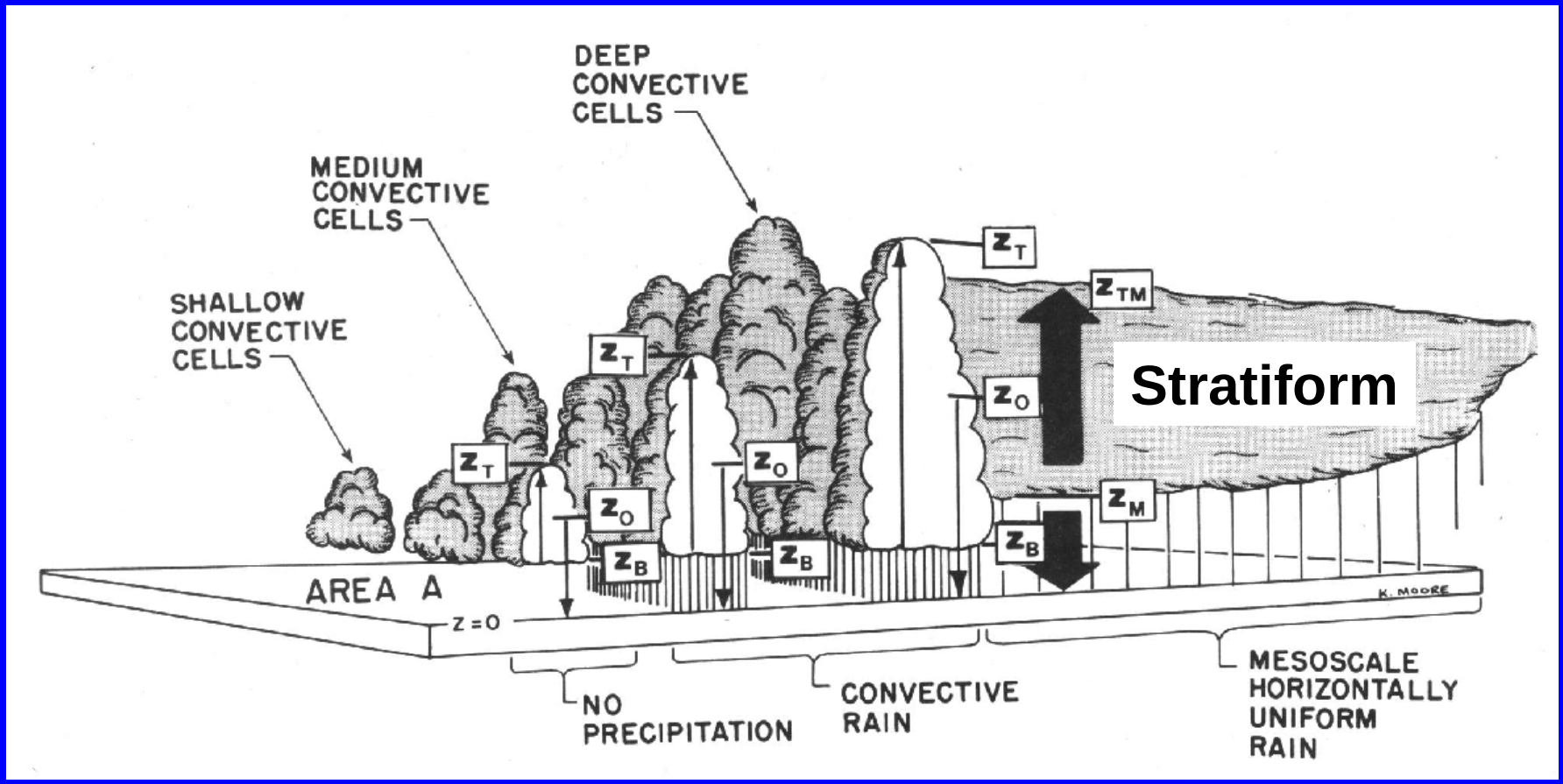
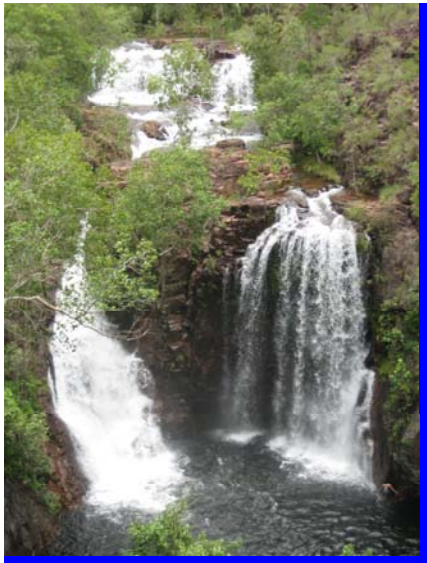
Tropical cloud population

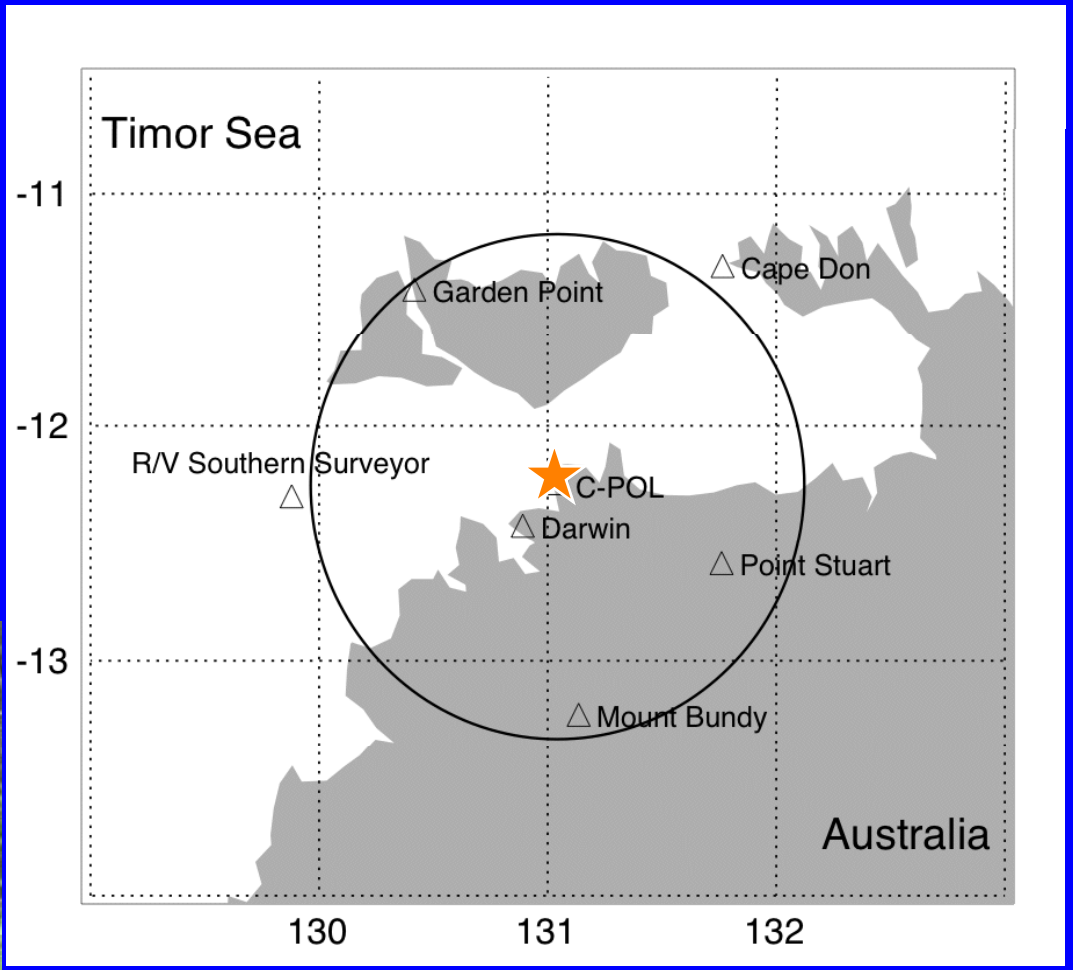


Houze et al. (1980)

TWP-ICE




DRAKE

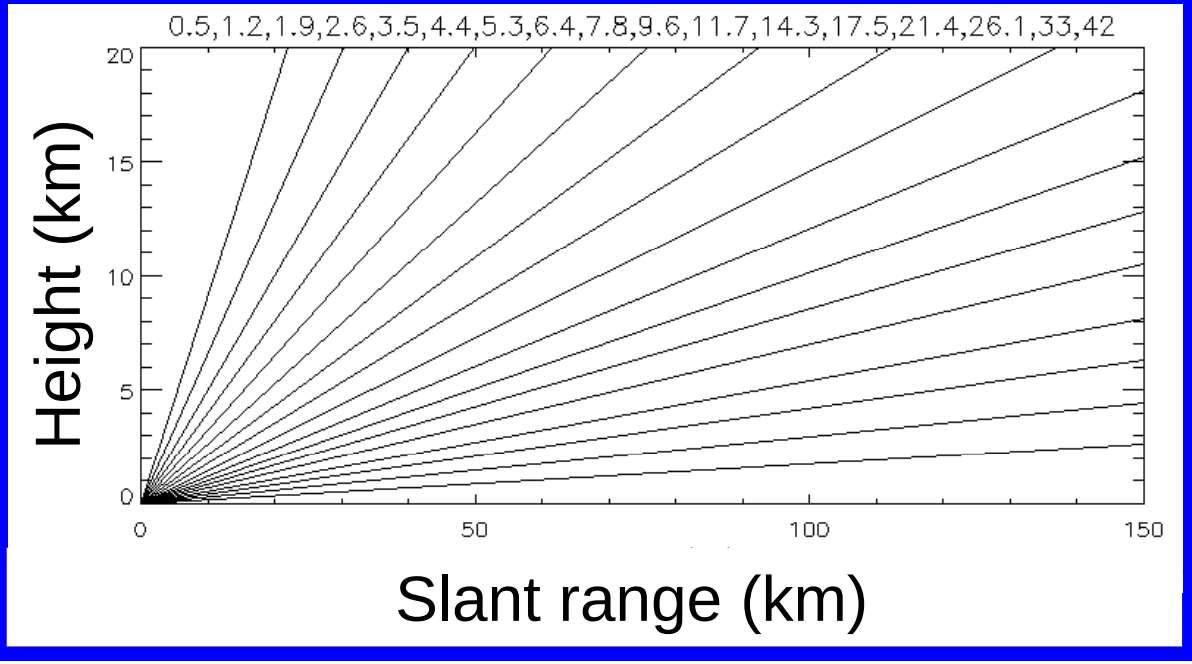

Timor Sea
-11
-12
-13
Garden Point
Cape Don
R/V Southern Surveyor
C-POL
Darwin
Point Stuart
Mount Bundy
Australia
130
131
132

BMRC's C-POL

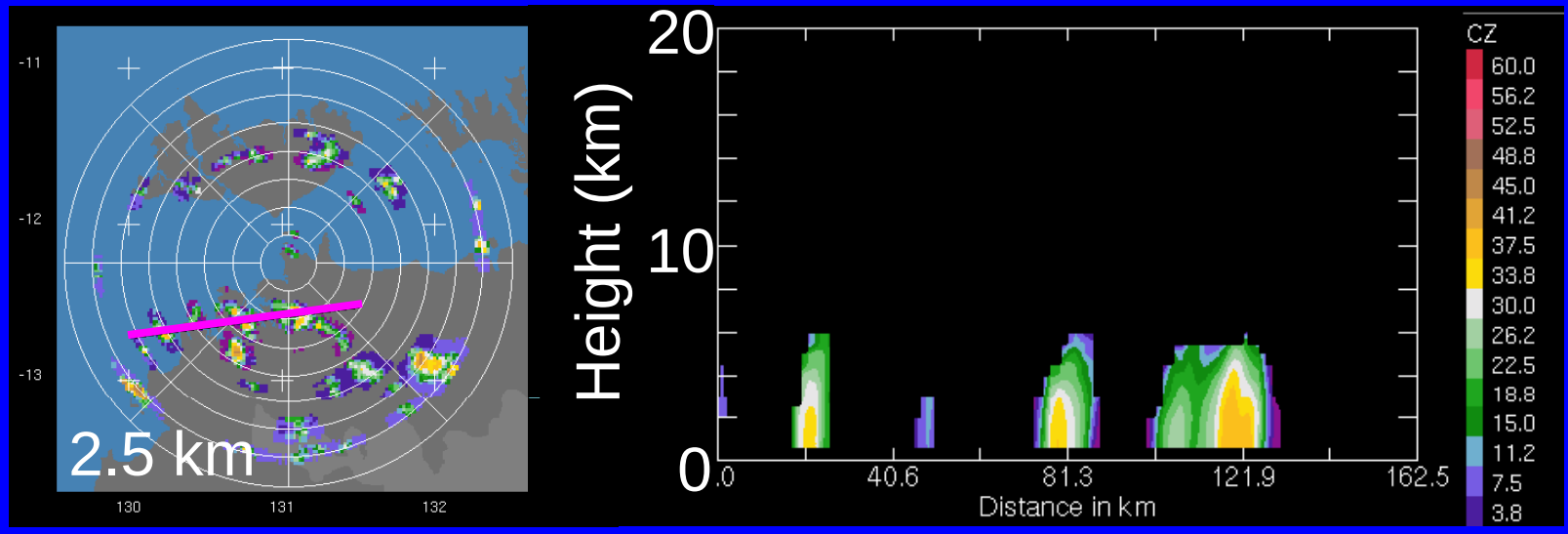
- C-band (5 cm) radar
- 1.0° beamwidth
- Minimum reflectivity used for this study is 0 dBZ
- Polarimetric variables used for attenuation correction

Volume scans:

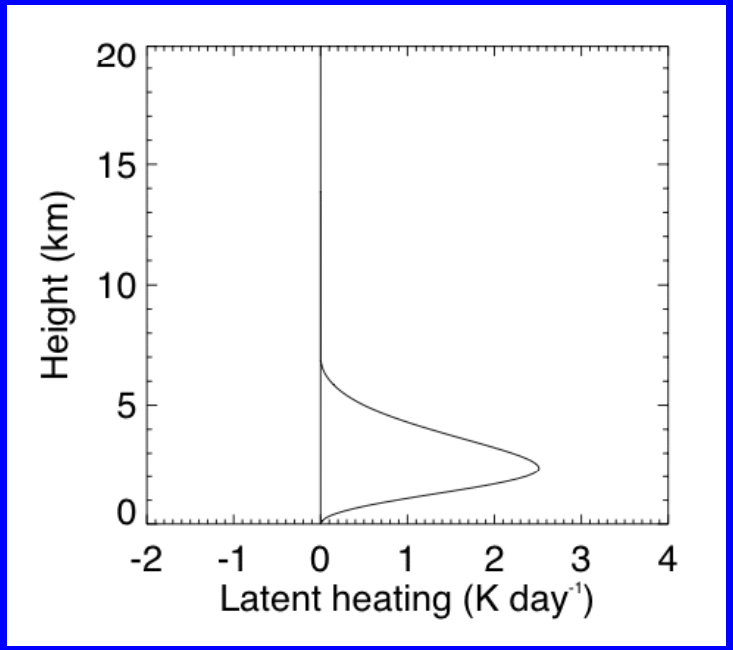
- every 10 min
- 17 tilts



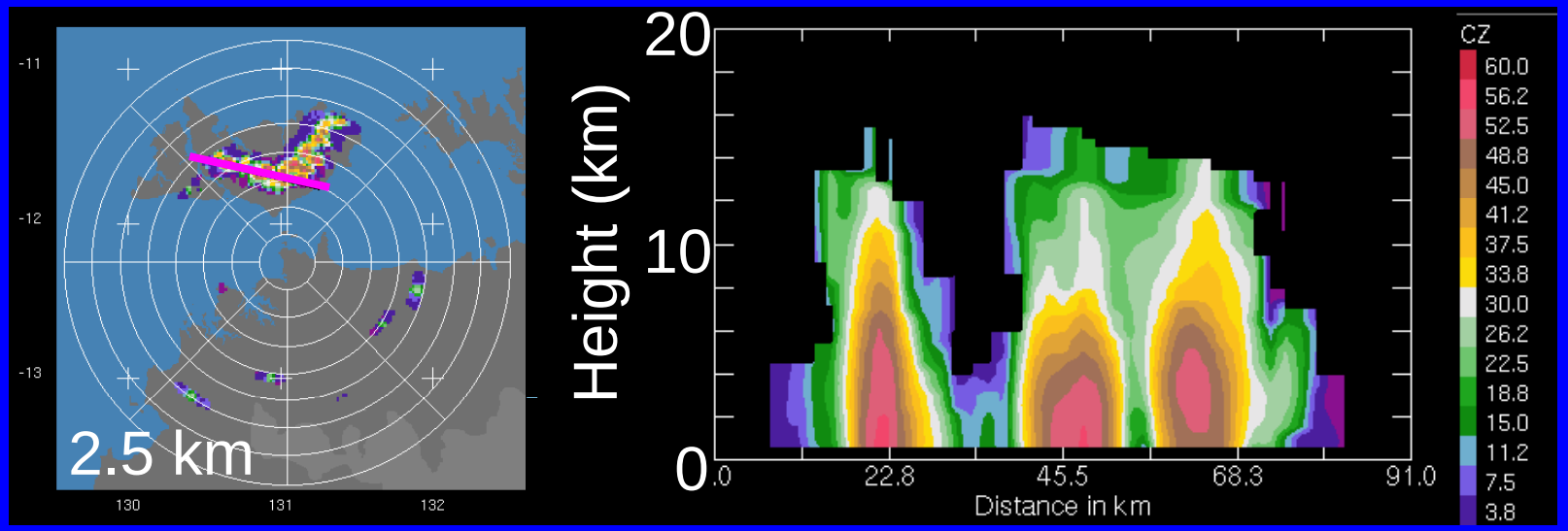
Shallow to moderate convection (26 Jan 06)



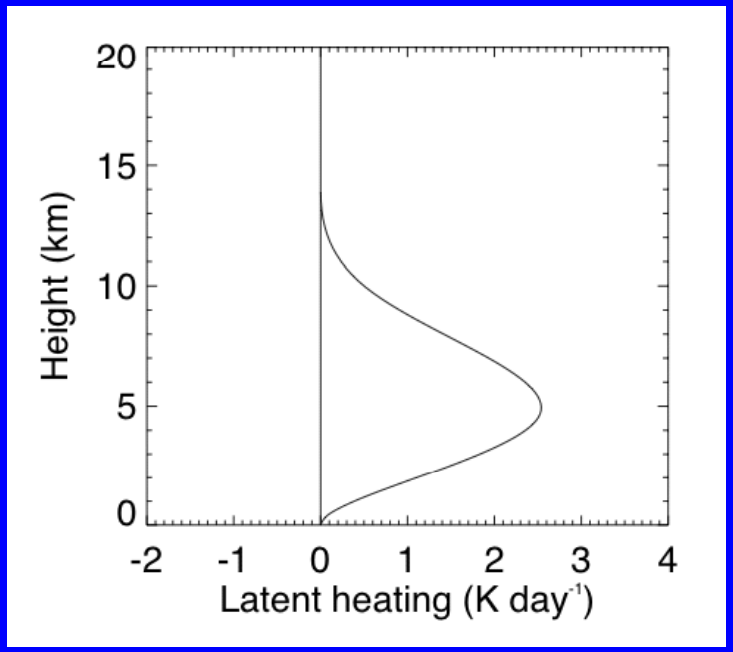
Latent Heating



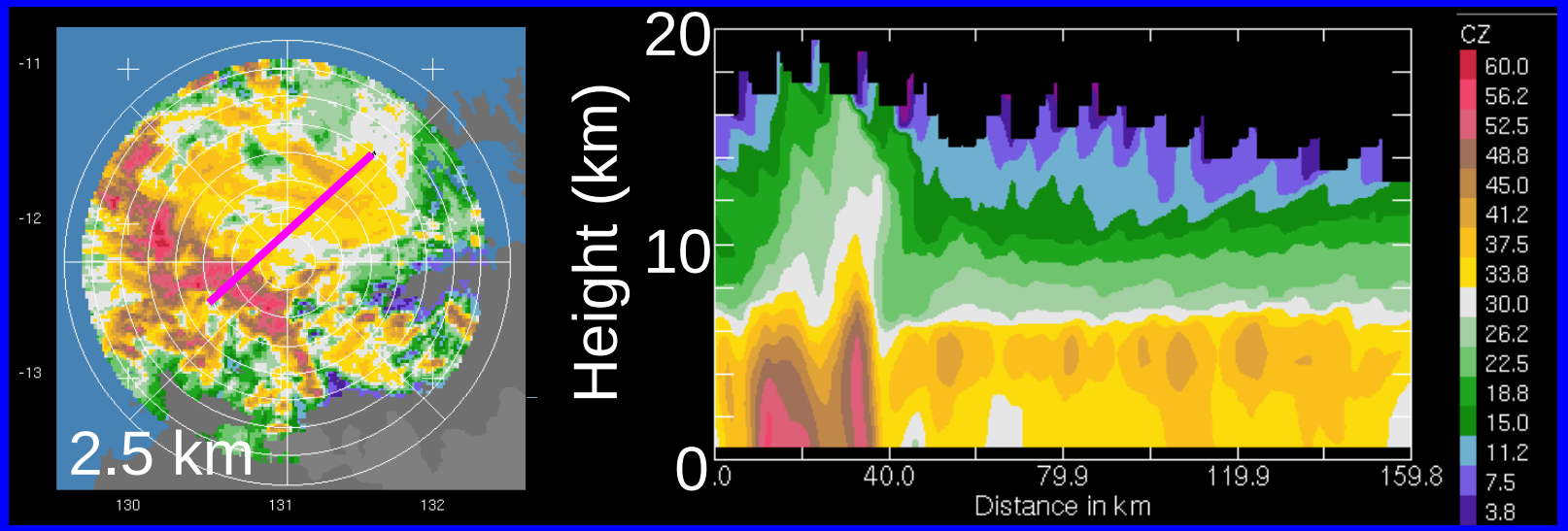
Deep convection (10 Feb 06)



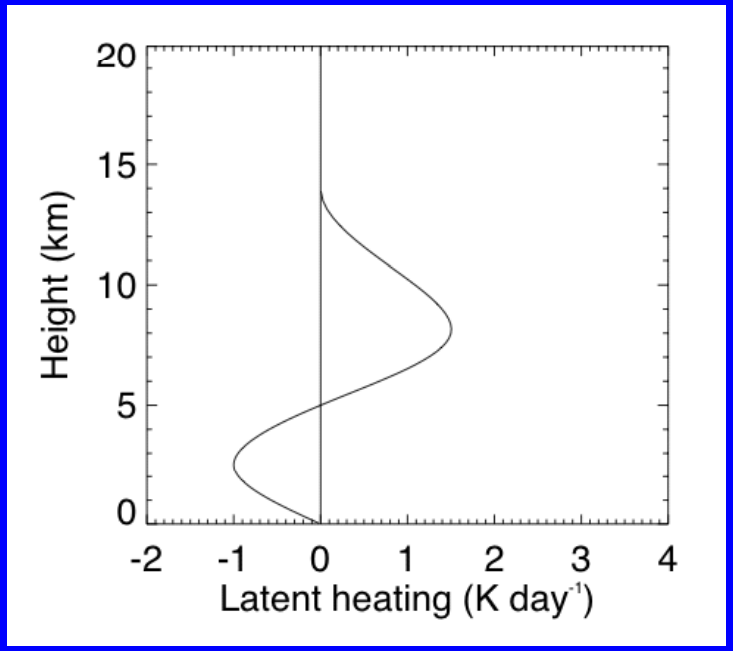
Latent Heating



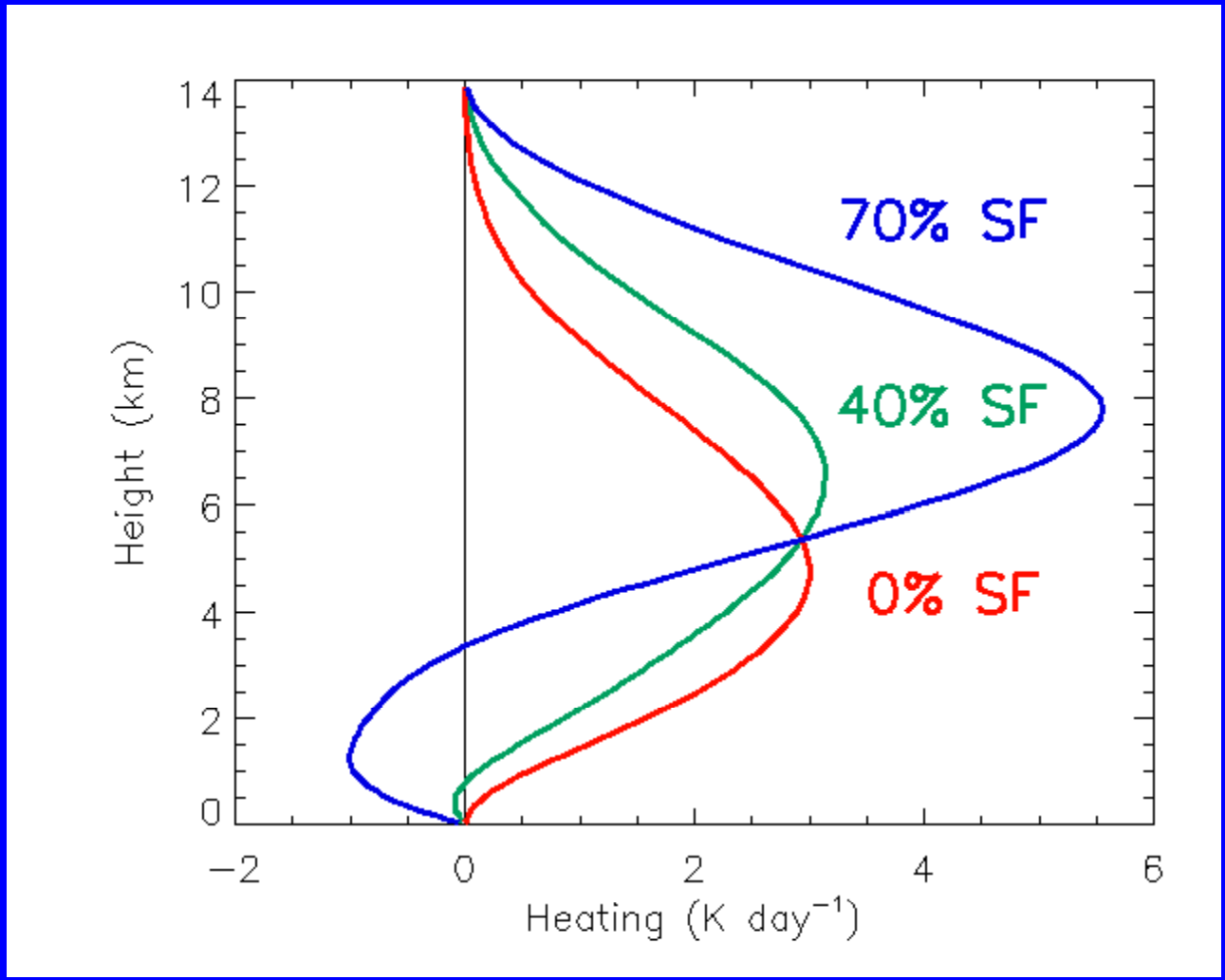
Leading-line/trailing stratiform MCS (23 Jan 06)



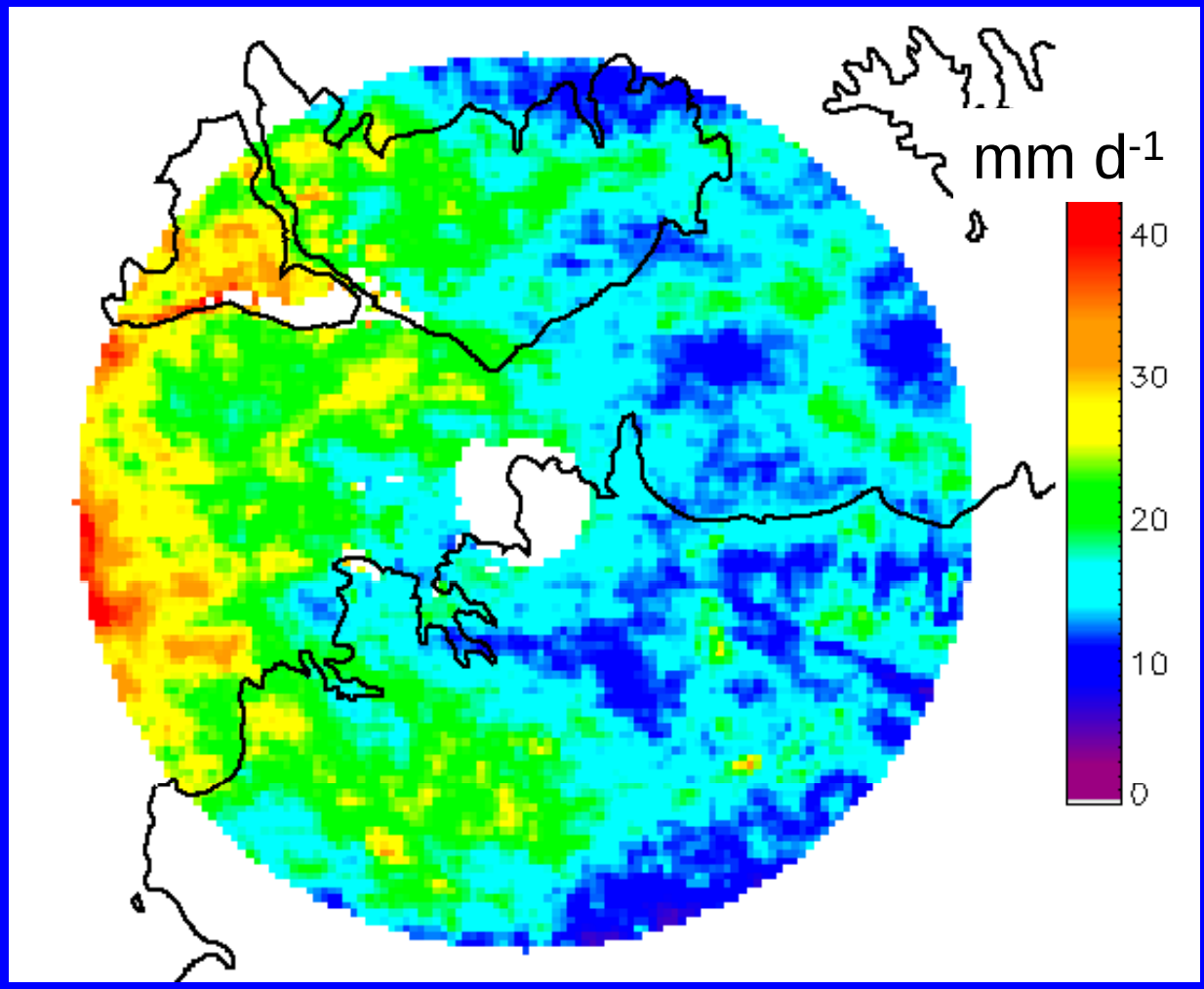
Latent Heating



Total latent heating profiles for 10 mm d^{-1} of rain

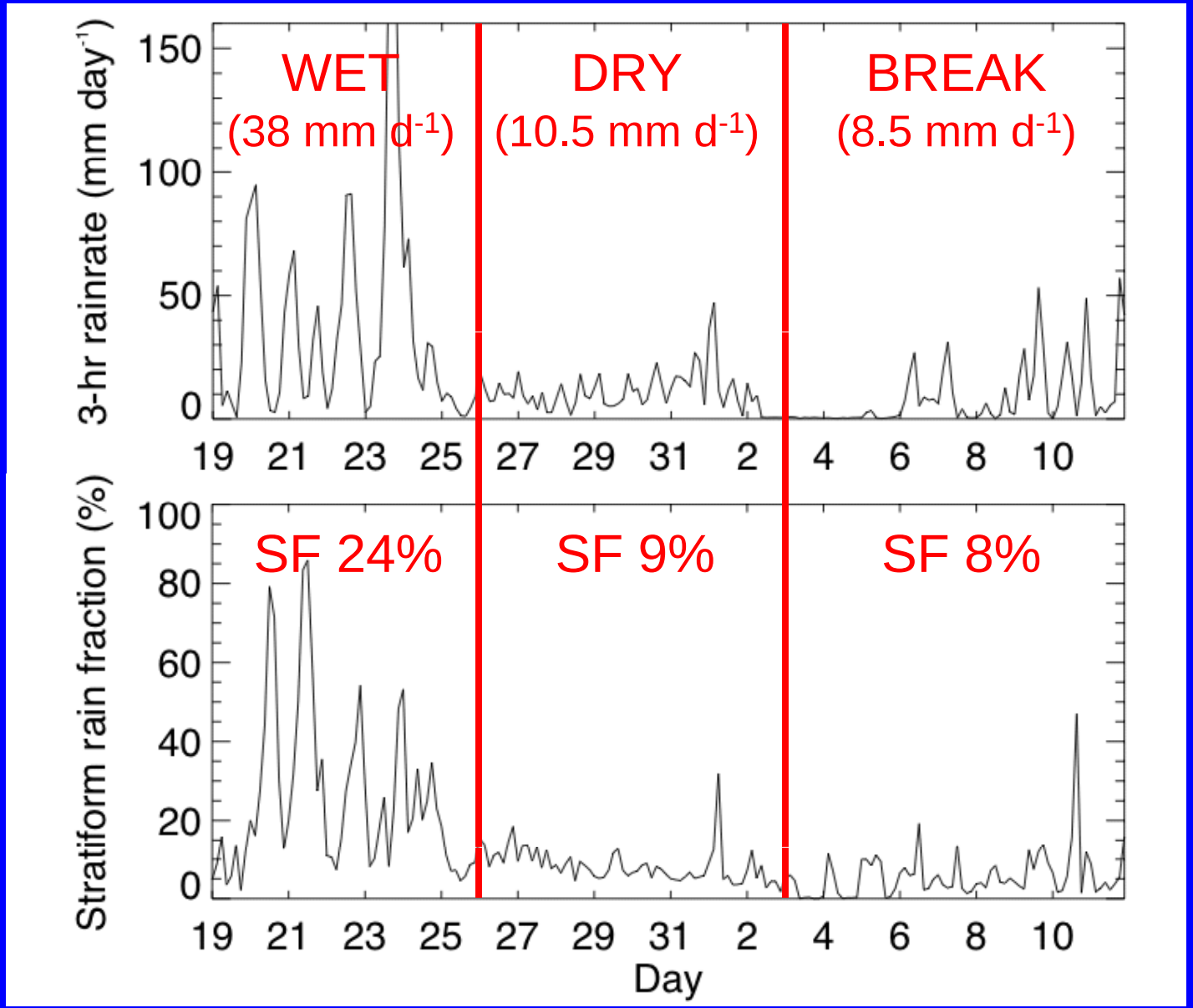


C-POL domain and TWP-ICE rainfall

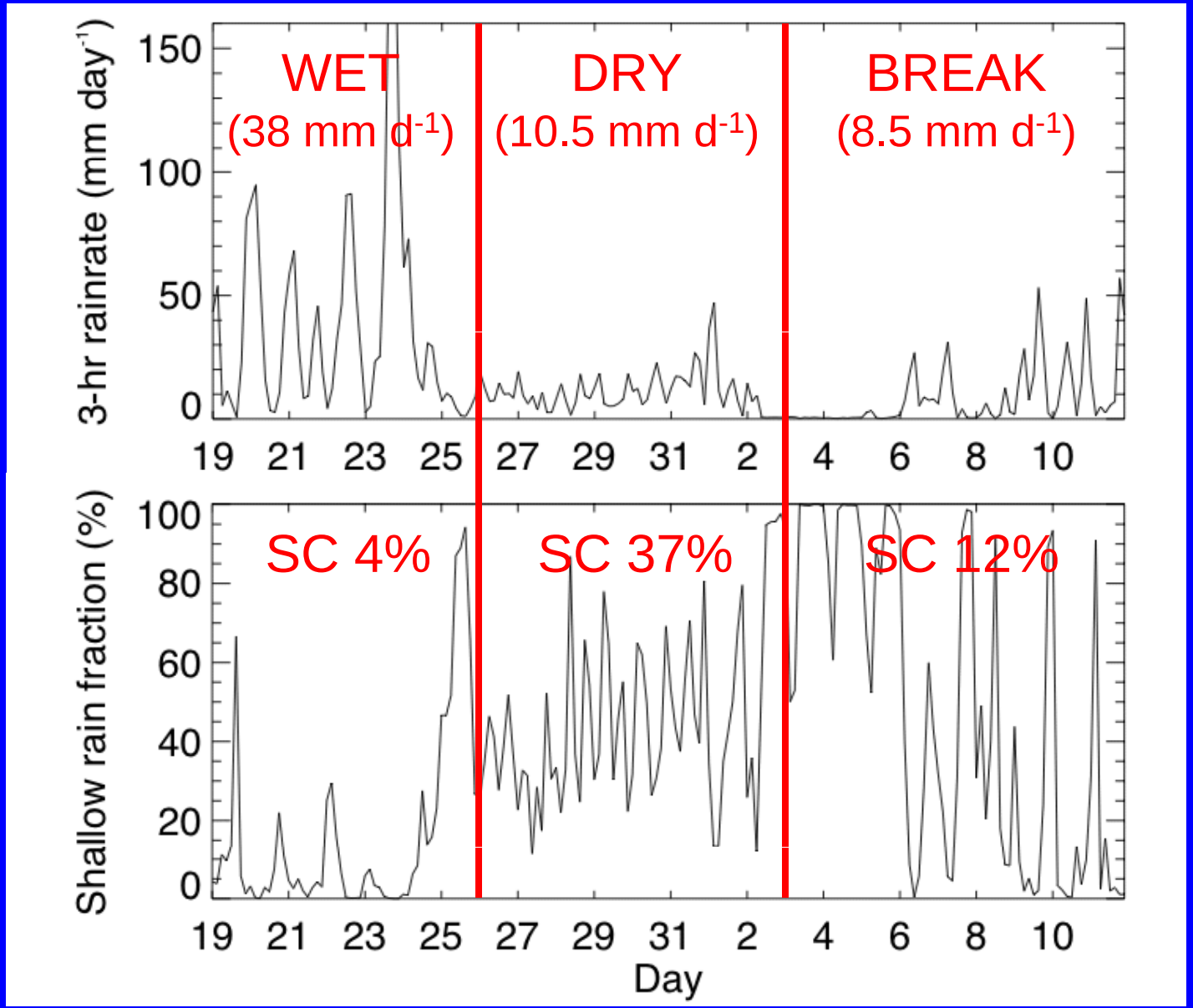


- Area average rainfall for 19 Jan - 11 Feb was 17.9 mm d^{-1}

Rainfall and stratiform rain fraction

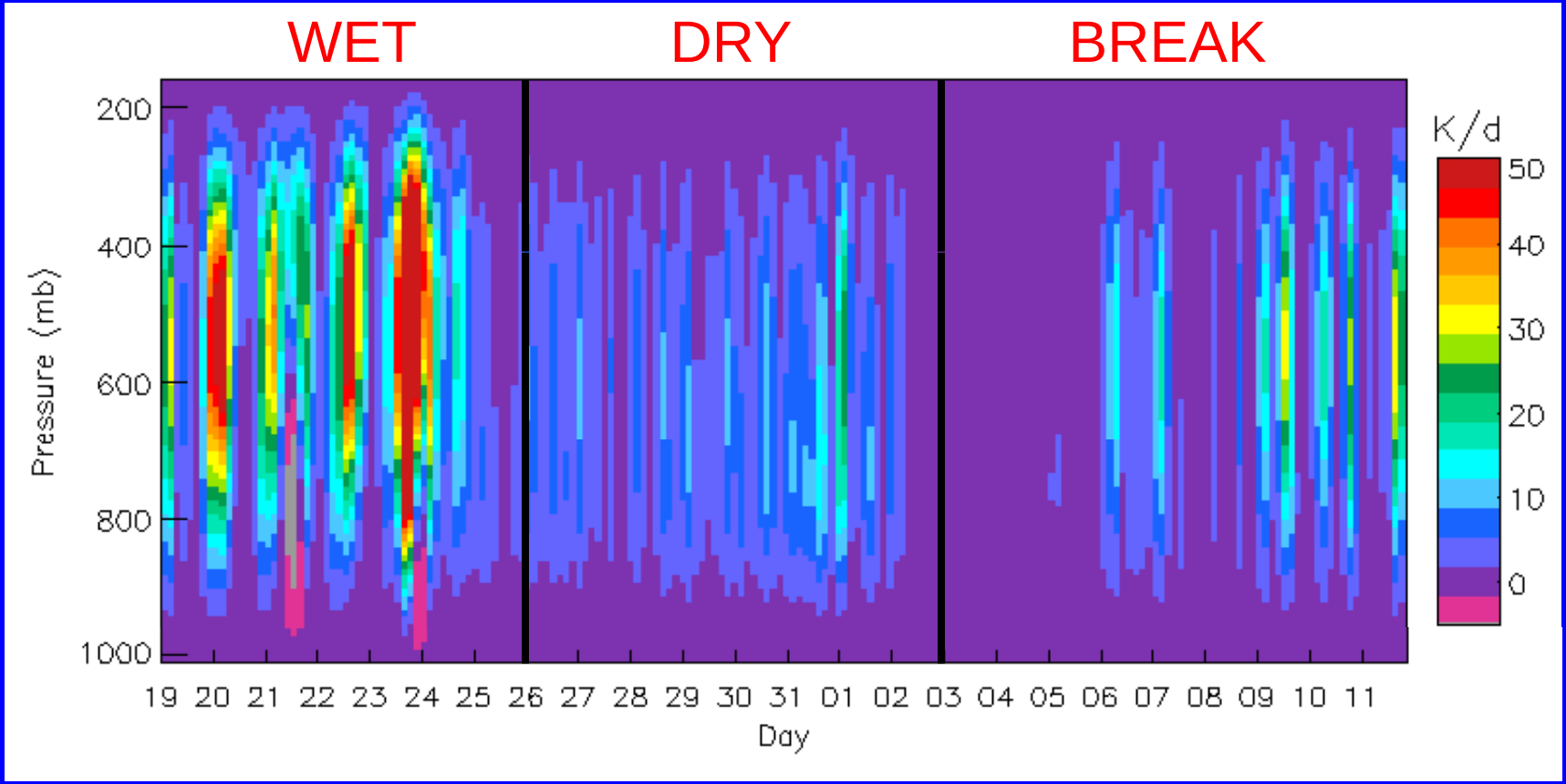


Shallow convective (< 8 km) rain fraction



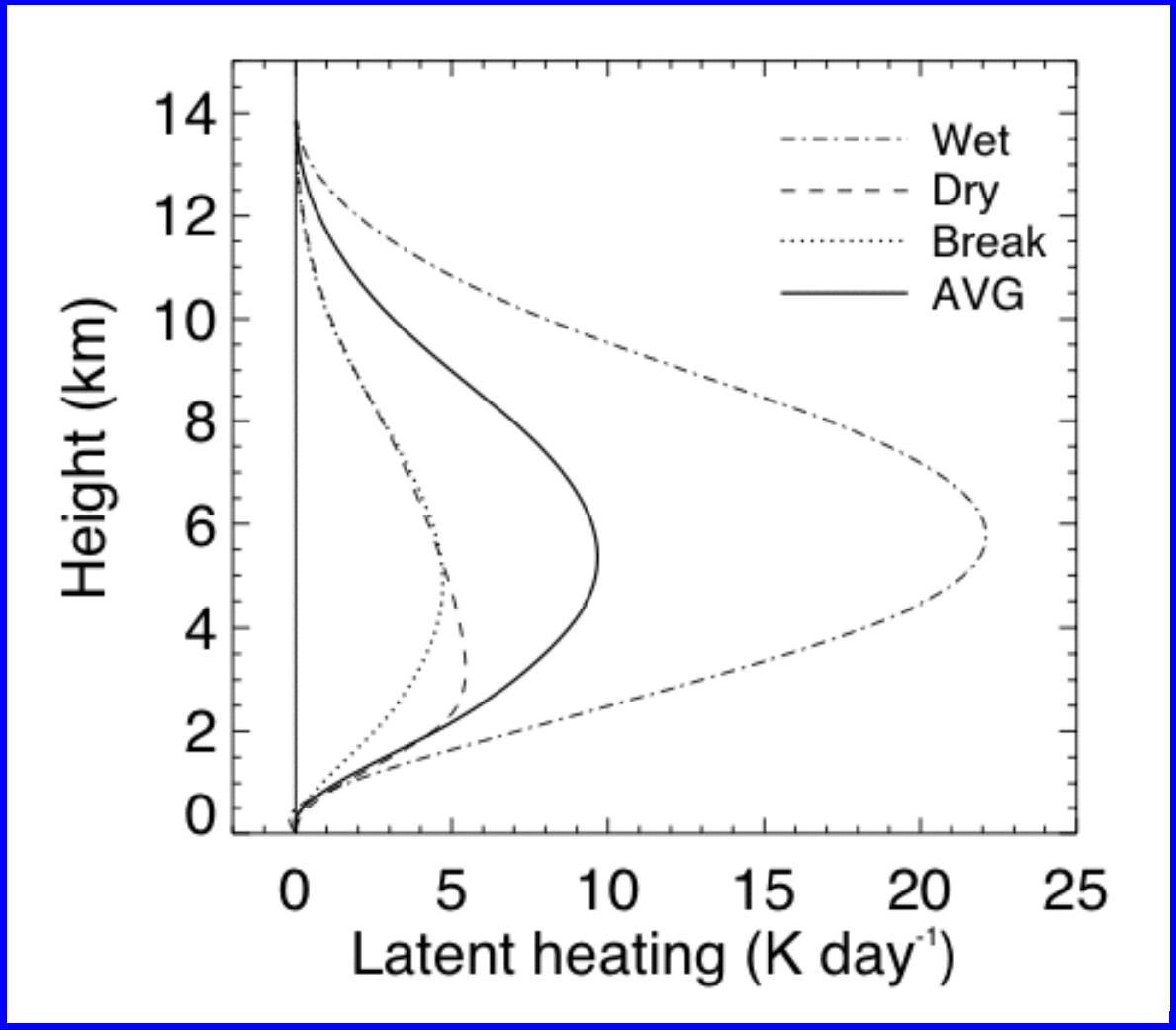
C-POL derived latent heating

19 January - 11 February 2006



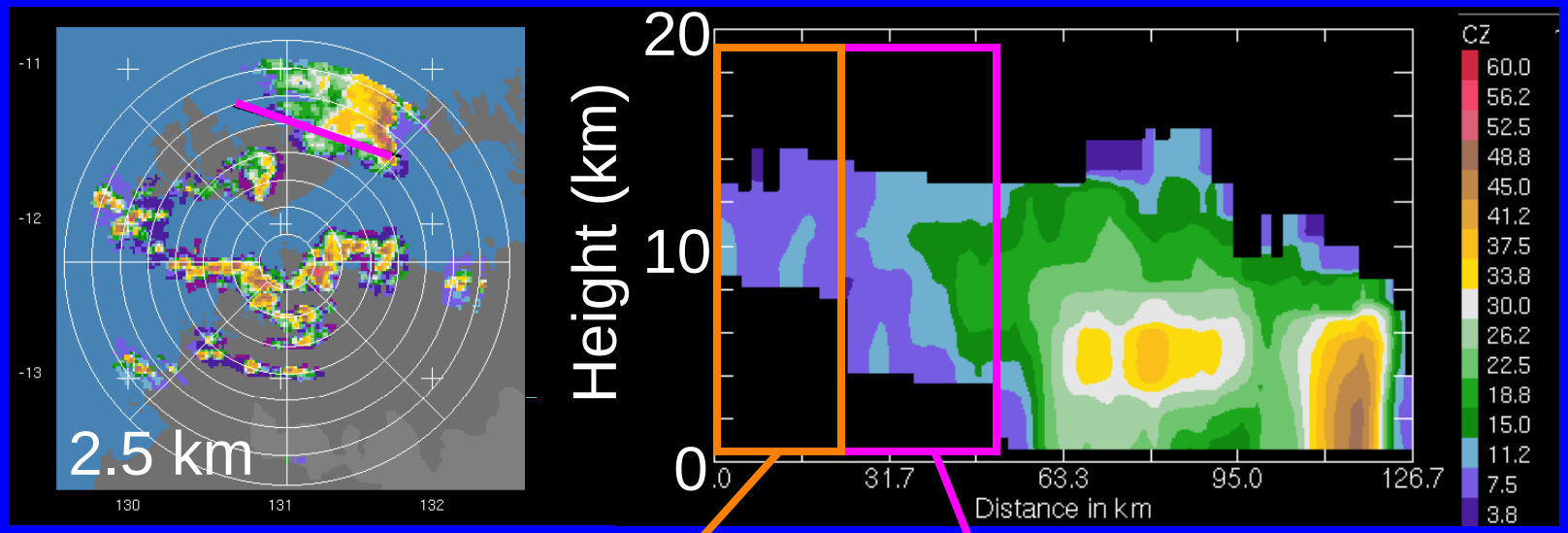
- Stronger and longer-lived systems during active monsoon, weaker and more shallow systems during dry monsoon

TWP-ICE C-POL latent heating by regime

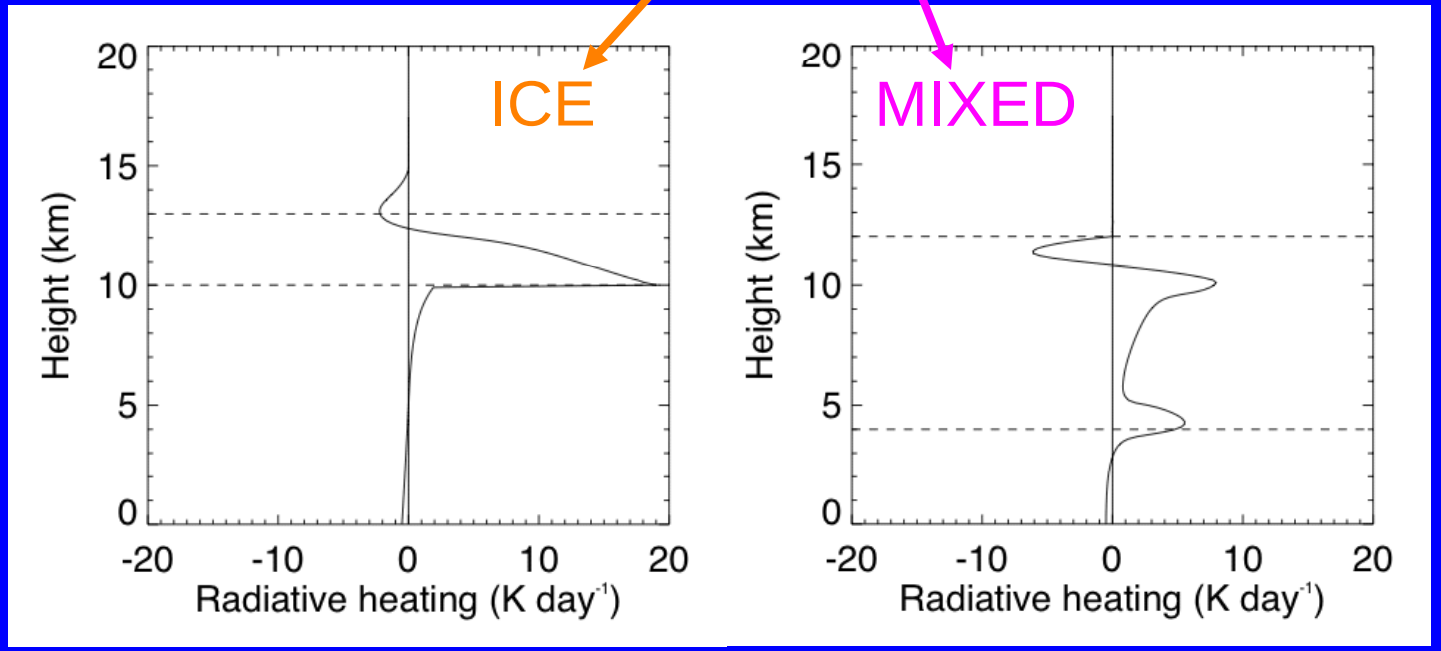


- Top heavy in active monsoon, bottom heavy in dry monsoon, moderate top heaviness in break period

Thick anvil (31 Jan 06)



RH

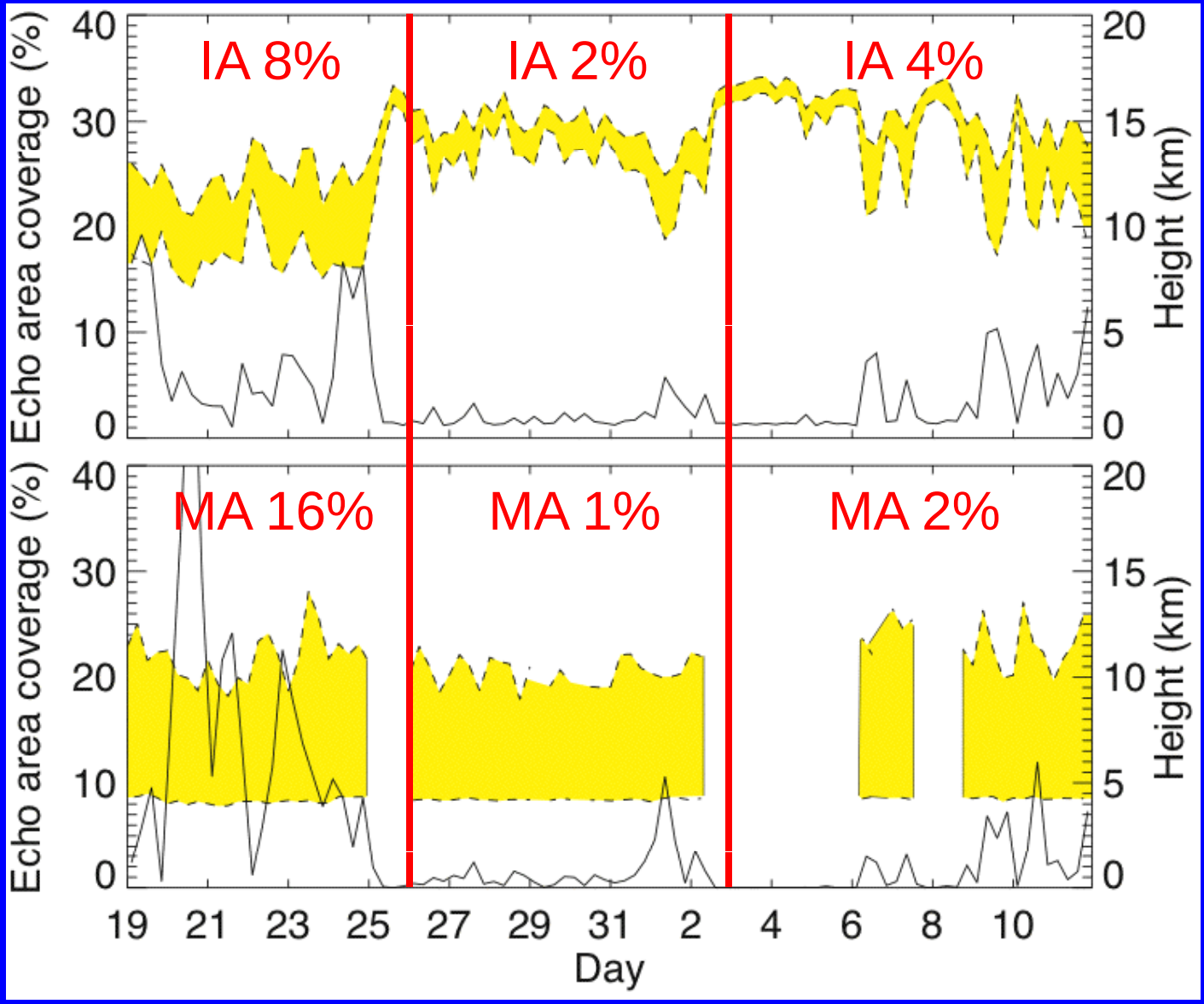


RH

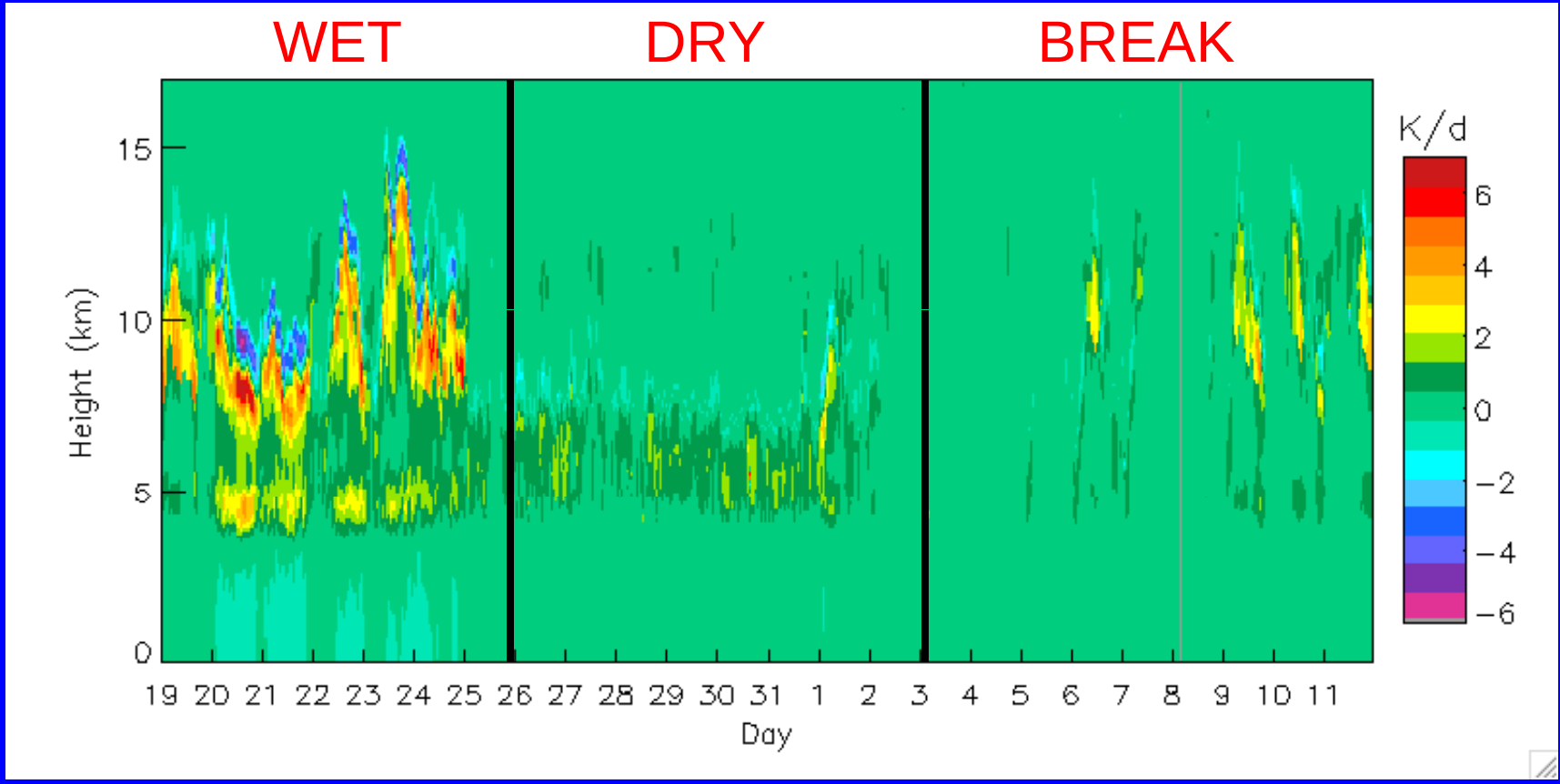
C-POL thick anvil area + vertical extent

ICE

MIXED



C-POL thick anvil + stratiform rain RH



- Strong mid-upper level heating in active monsoon, bottom heavy in dry monsoon, most upper-level heating in break period

Conclusions

- Wet monsoon: strong, top heavy LH (> 20 K d^{-1}) and mid-upper level RH (~1.5 K d^{-1}) from prevalence of MCSs that produce large amounts of stratiform rain and cloud. [LH >> RH]
- Dry monsoon: Deep convection and anvil production were suppressed, making LH and RH profiles bottom heavy and smaller in magnitude (e.g., 5 and ~1 K d^{-1}). [LH > RH]
- Break period: Deep land convection caused mid-level LH peak of 5 K d^{-1} and preferentially formed upper level ice anvil and thus more RH (~0.5 K d^{-1}) above 11 km. [LH > RH]
- Future work will refine input heating profiles, use ARM measurements to account for portion of clouds C-POL can't see, and apply results to satellite radar observations for studies of the dynamical relevance of anvil radiative heating.