Updraft cores in the new TWPICE-GigaLES: Vertical velocity statistics and visualization

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CMMAP

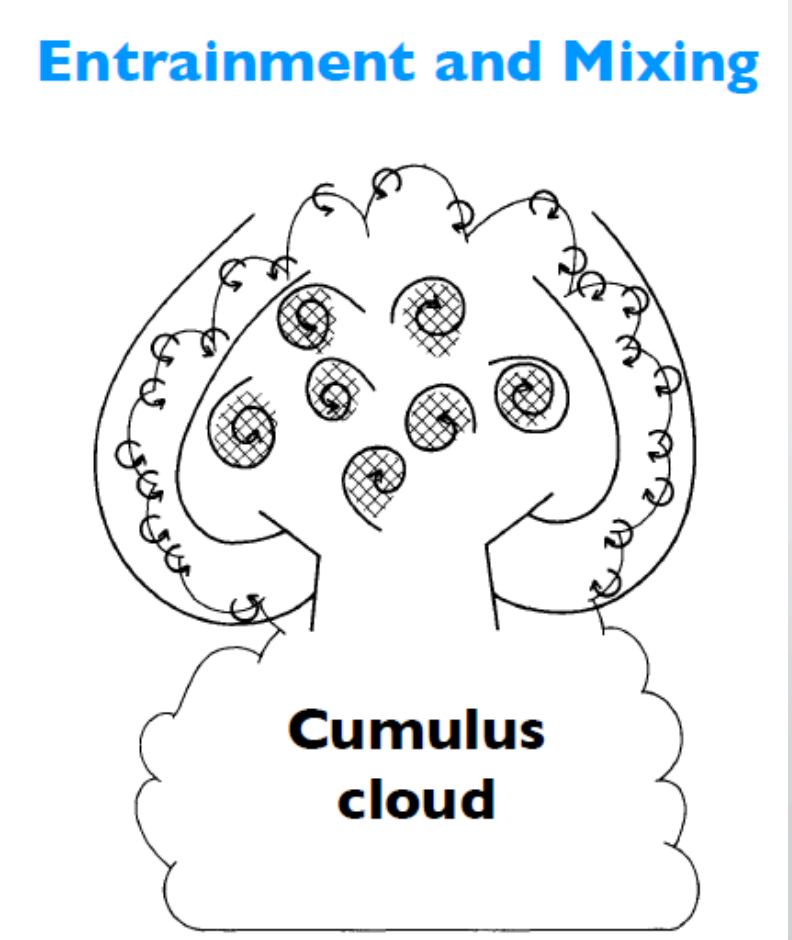
Reach for the sky.

Outline

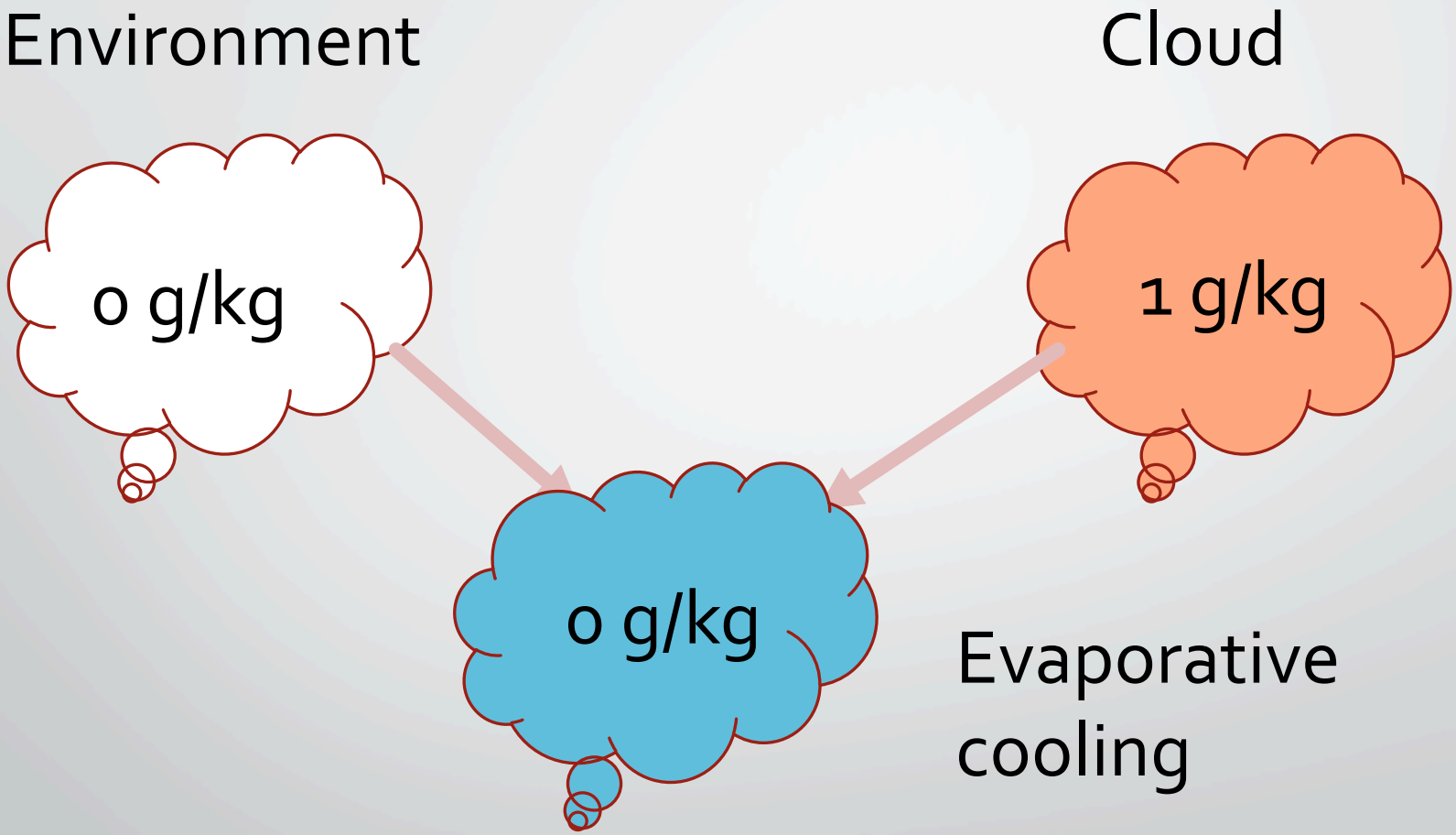
- Previous M.S. work → new motivations, questions
  - What determines an updraft's ultimate top height?
  - What is the updraft structure inside a "cloud"?
- GigaLES1 ←→ GATE statistics
- GigaLES2 ←→ GATE statistics
- Visualizations

Entrainment

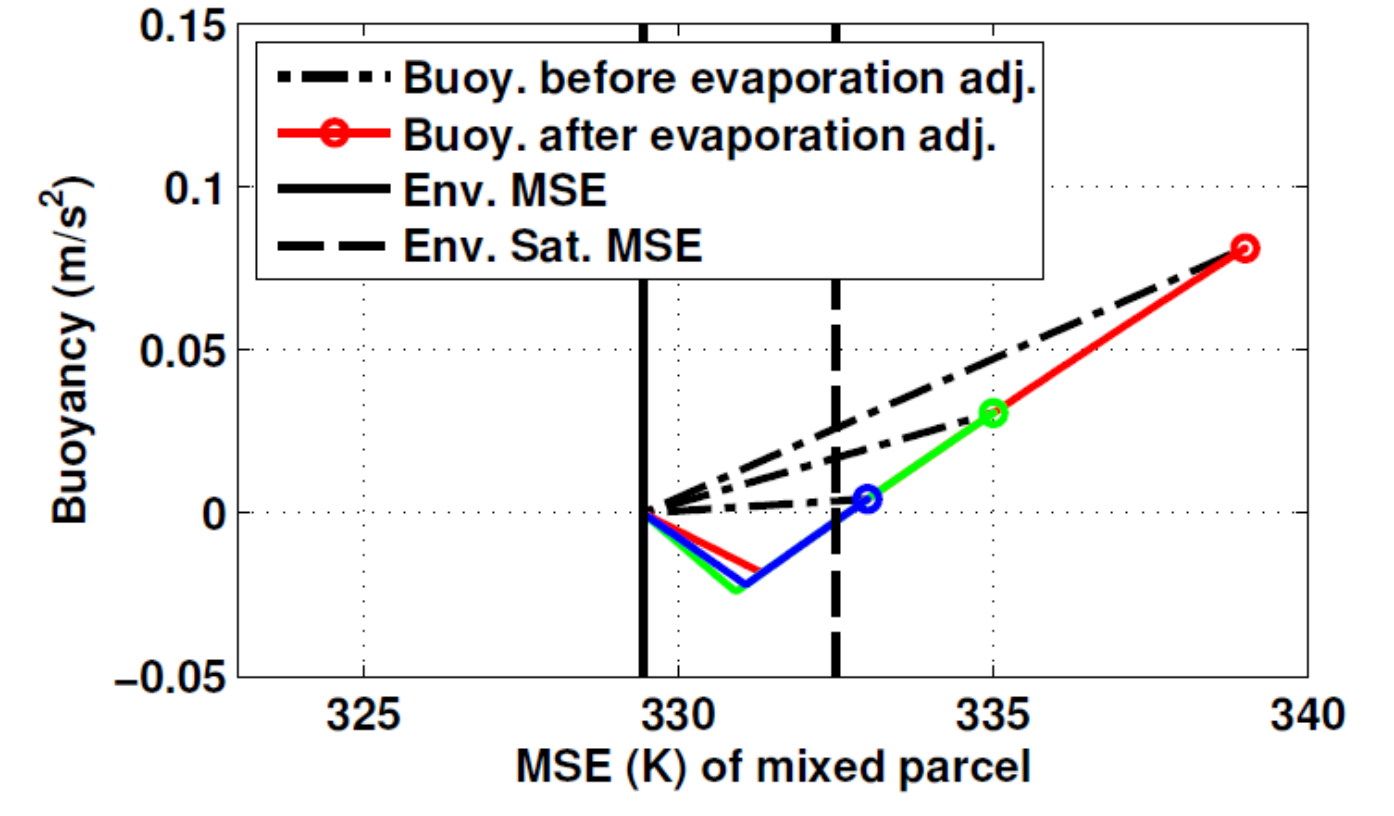
- What causes a cloudy parcel to stop rising at a particular height?



Mixing at cloud edge



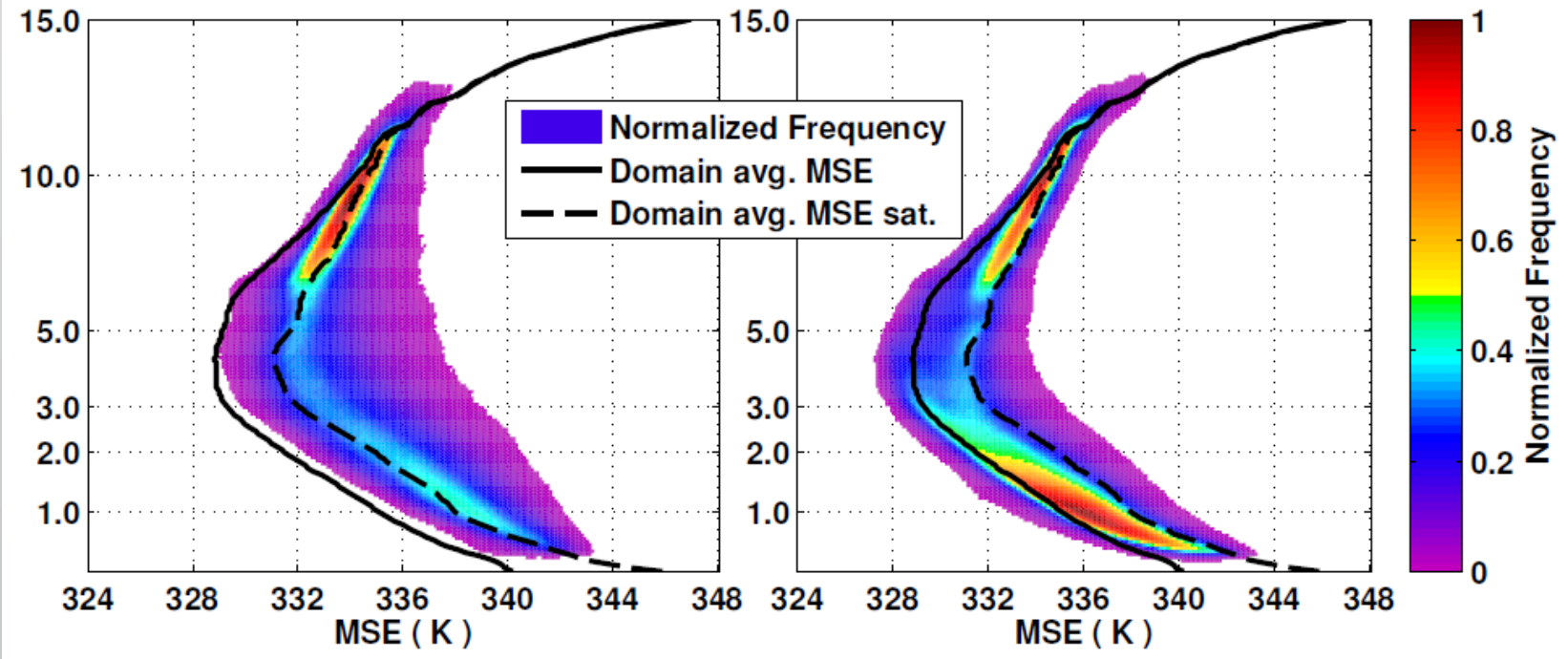
Mixing analysis at 3 km height



MSE Frequency

CLOUDY UPDRAFTS

NEAR CLOUD ENVIRONMENT



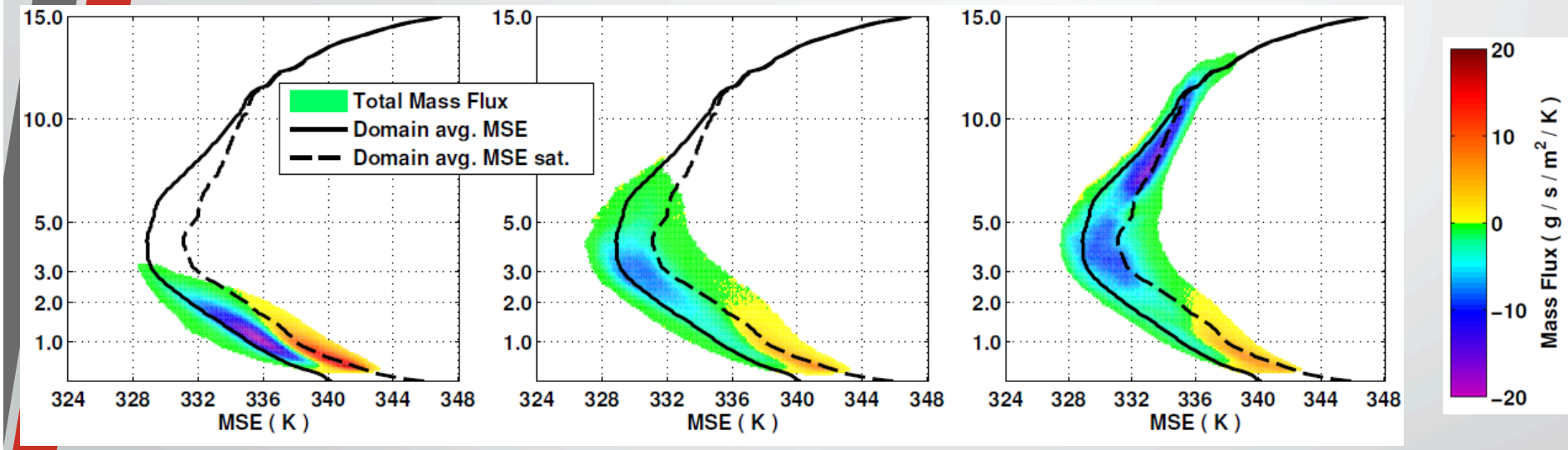
Mass Flux in shells around different height clouds

What if there was some variability in the cloud shell mass flux that could explain some of the CTH distribution?

Mass Flux in shells around different height clouds

…but it turns out the mass flux in the cloud shells doesn't vary appreciably from cloud to cloud

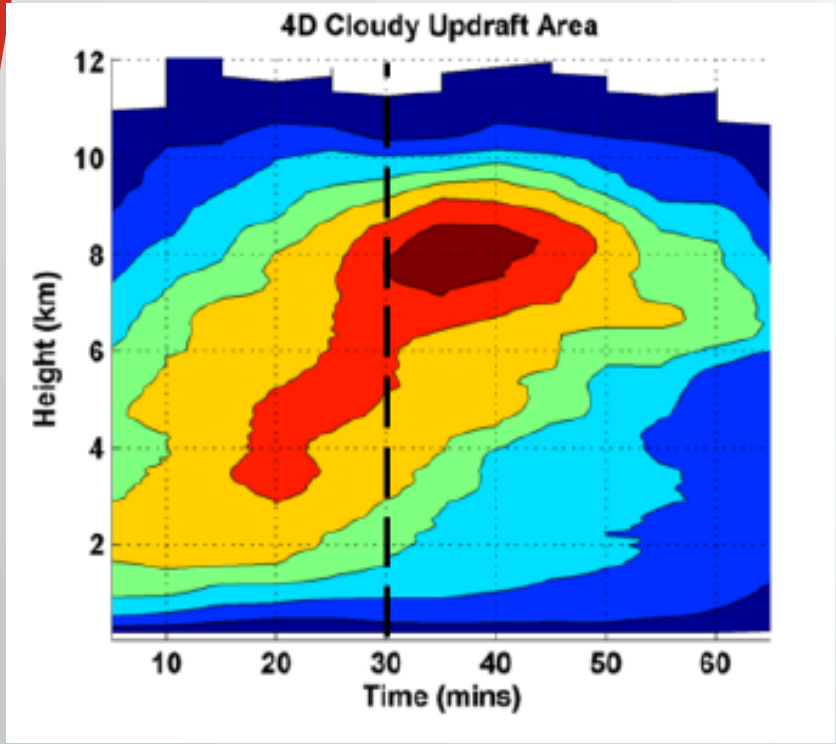
Mass Flux in shells around different height clouds

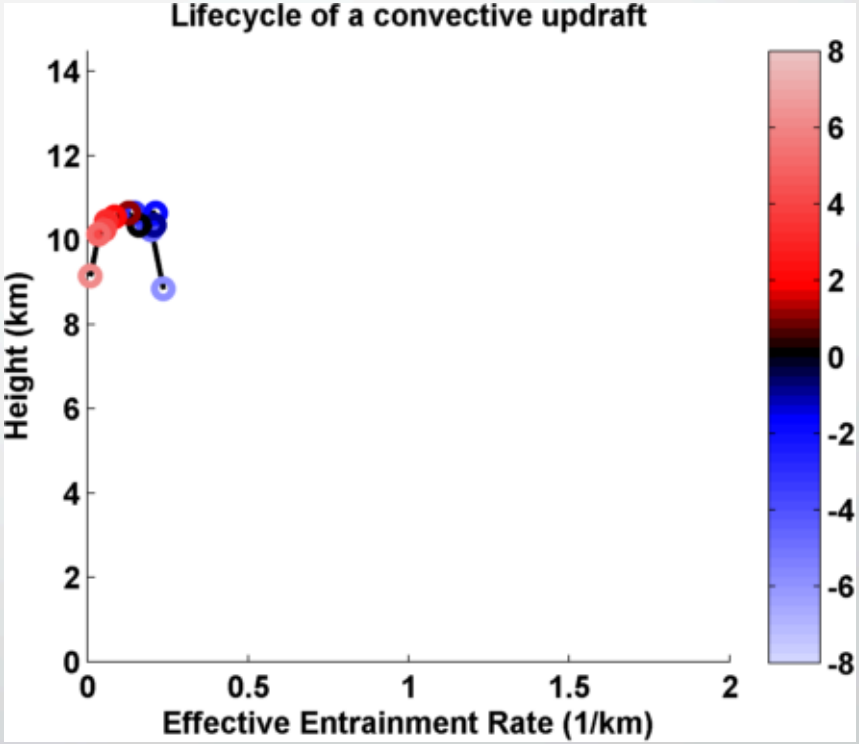


Tracking cloud cores through time

So we looked for a way to directly track cloud cores to understand the CTH distribution

Tracking cloud cores through time





Tracking cloud cores through time

Hints of interesting results, but not enough data…

GigaLES2
TWPICE

Preliminary analysis of updraft cores

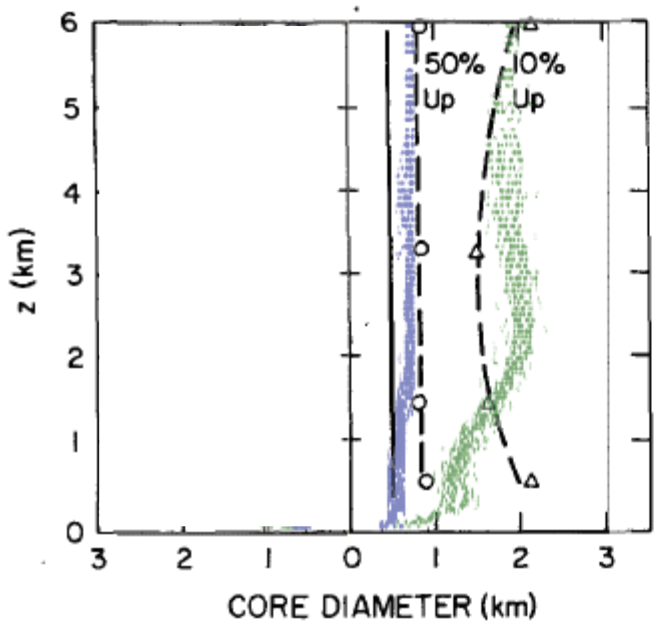
JOURNAL OF THE ATMOSPHERIC SCIENCES

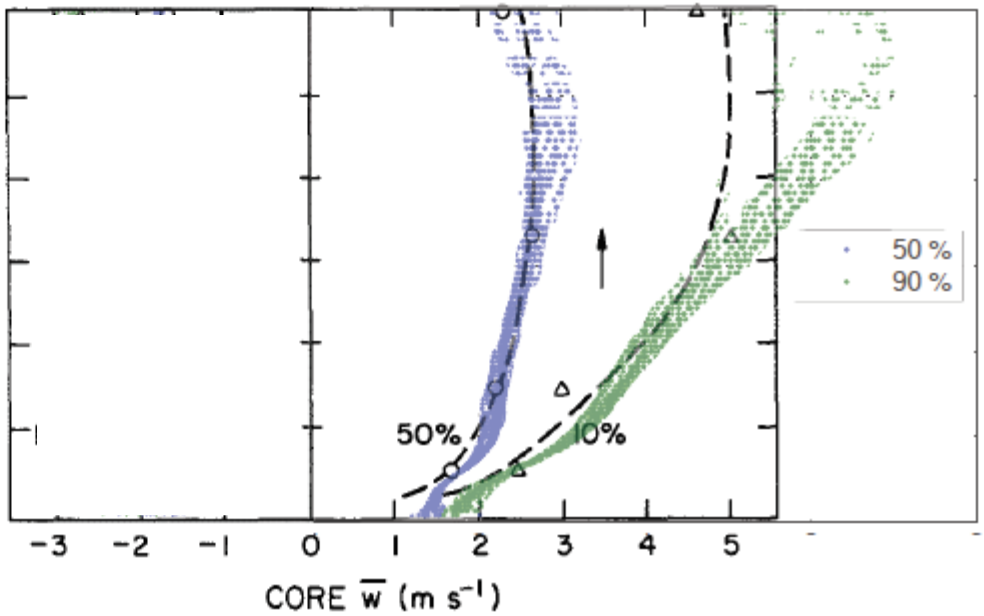
Cumulonimbus Vertical Velocity Events in GATE. Part I: Diameter, Intensity and Mass Flux

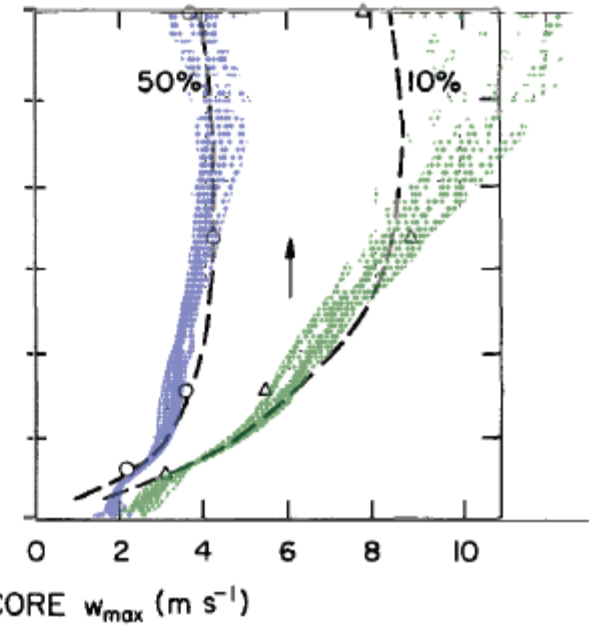
MARGARET A. LEMONE AND EDWARD J. ZIPSER

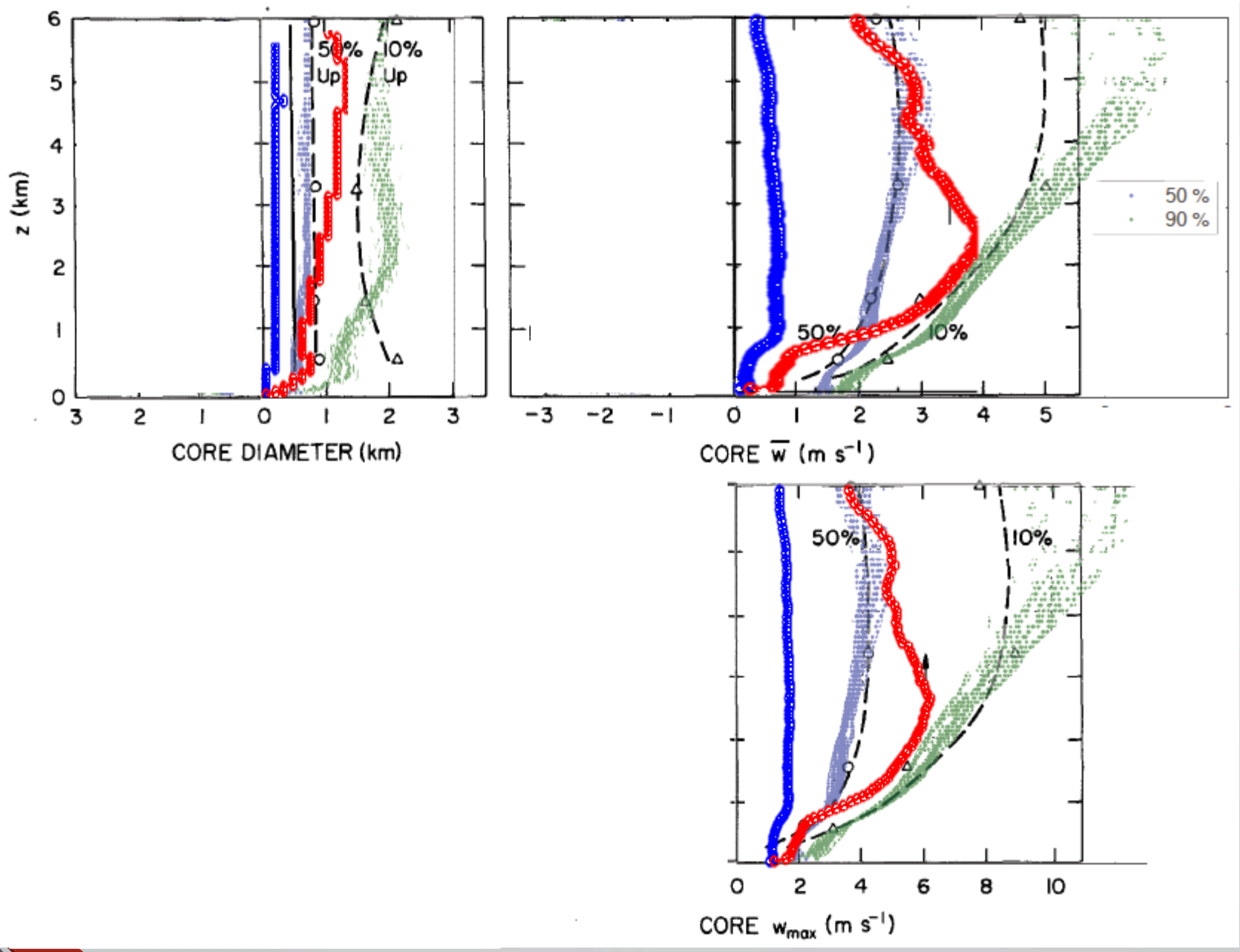
National Center for Atmospheric Research,[1] Boulder, CO 80307

(Manuscript received 21 March 1980, in final form 18 July 1980)


z (km)
50%
Up
10%
Up
CORE DIAMETER (km)


50 %
90 %
50%
10%
CORE $\overline{w}$ (m s^{-1})

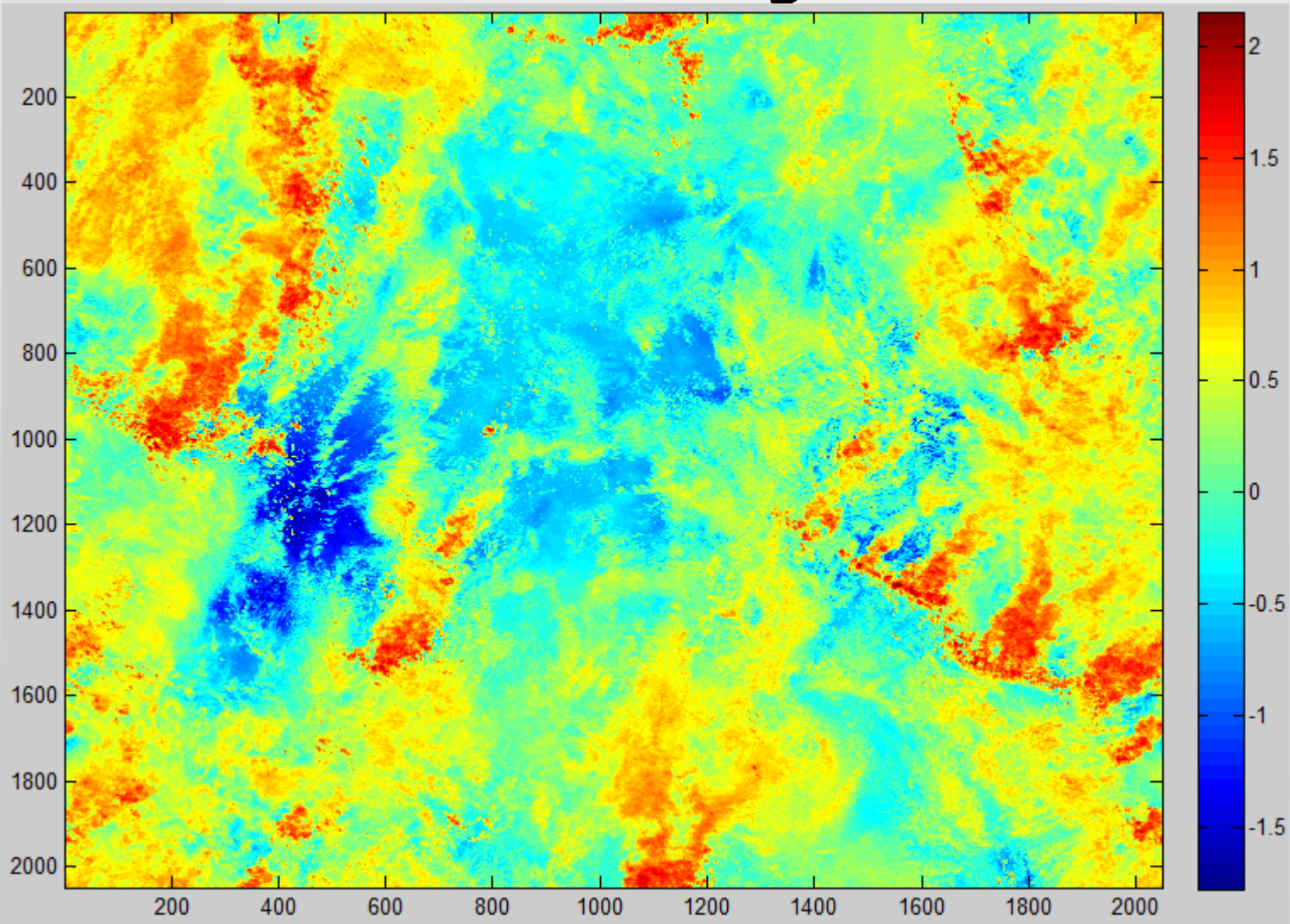

50%
10%
CORE w_{max} (m s^{-1})


z (km)
50%
Up
10%
Up
CORE DIAMETER (km)
50%
10%
50 %
90 %
CORE $\overline{w}$ (m s^{-1})
50%
10%
CORE w_{max} (m s^{-1})

GigaLES2
TWPICE

SHDOM visualization

CWP at t=129600



CWP