High-Resolution Vertical Structure of Chantal and Interactions with Environmental Shear

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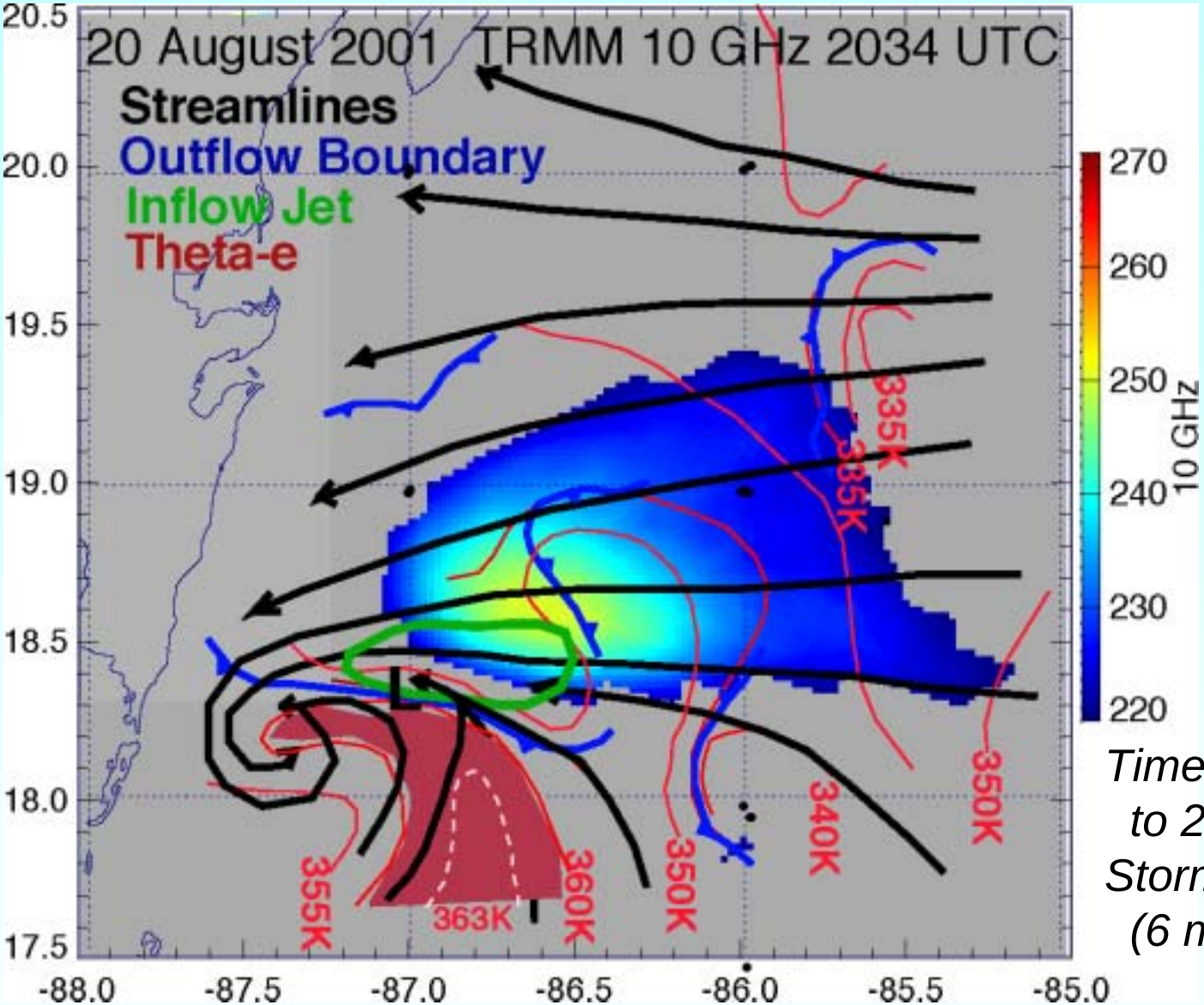
Objectives

- Document intense convective burst in Chantal
  - What sustains it?
  - What is its role in storm intensification?
  - Why supercell-like characteristics?
- Utilize high-resolution a/c measurements (EDOP…) into larger scale context provided by dropsondes, flight level and satellite.

Data Sets

- ER-2: EDOP, MAS, Flt. Lev
- DC-8: PR-2 (14 GHz), MMS, JLH, dropsondes
- P3: Flt. Level, dropsondes, radar
- Satellite: GOES, TRMM

DC-8 & P3 Dropsonde Analysis 0.2 km



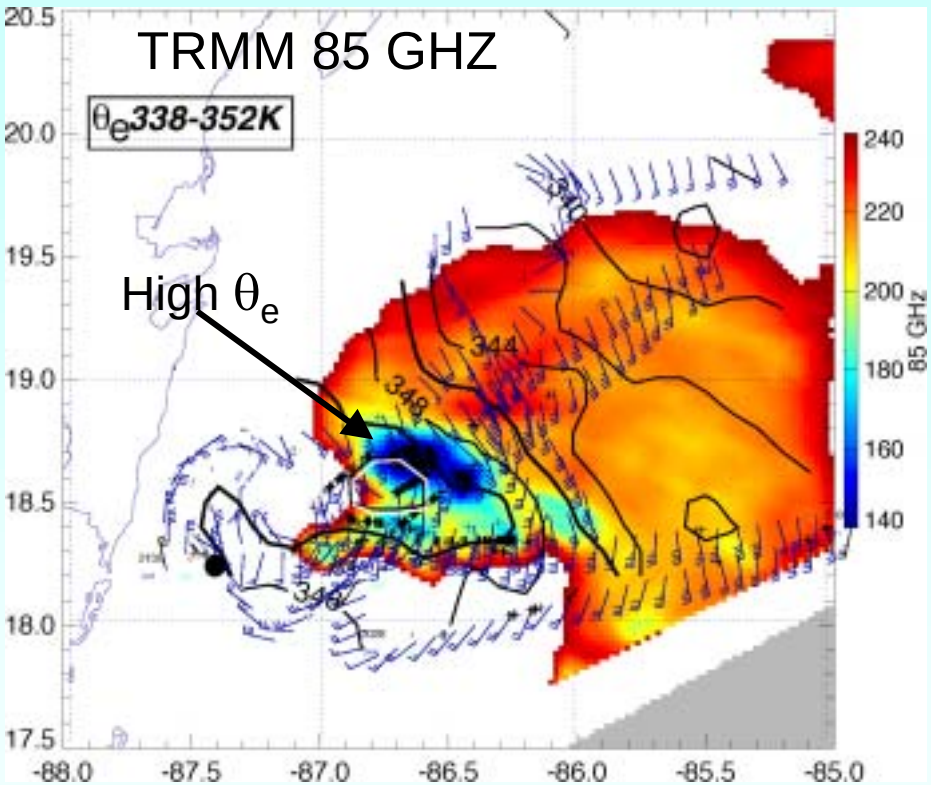
Time Adjusted to 2115 UTC Storm Relative (6 ms^{-1} @280^{o})

➡ *Low pressure "meso-low" and precip. located NE of LLC*

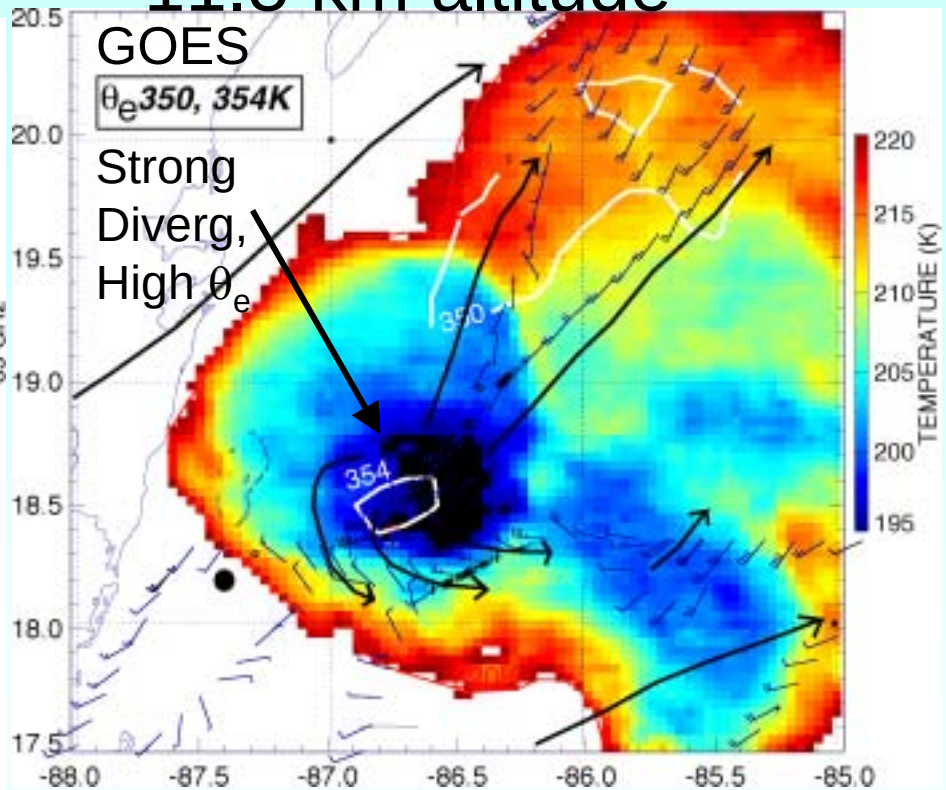
P3 & DC-8 Flight Level θ_e and Winds

Storm relative and time adjusted to 2115 UTC

4.3 km altitude

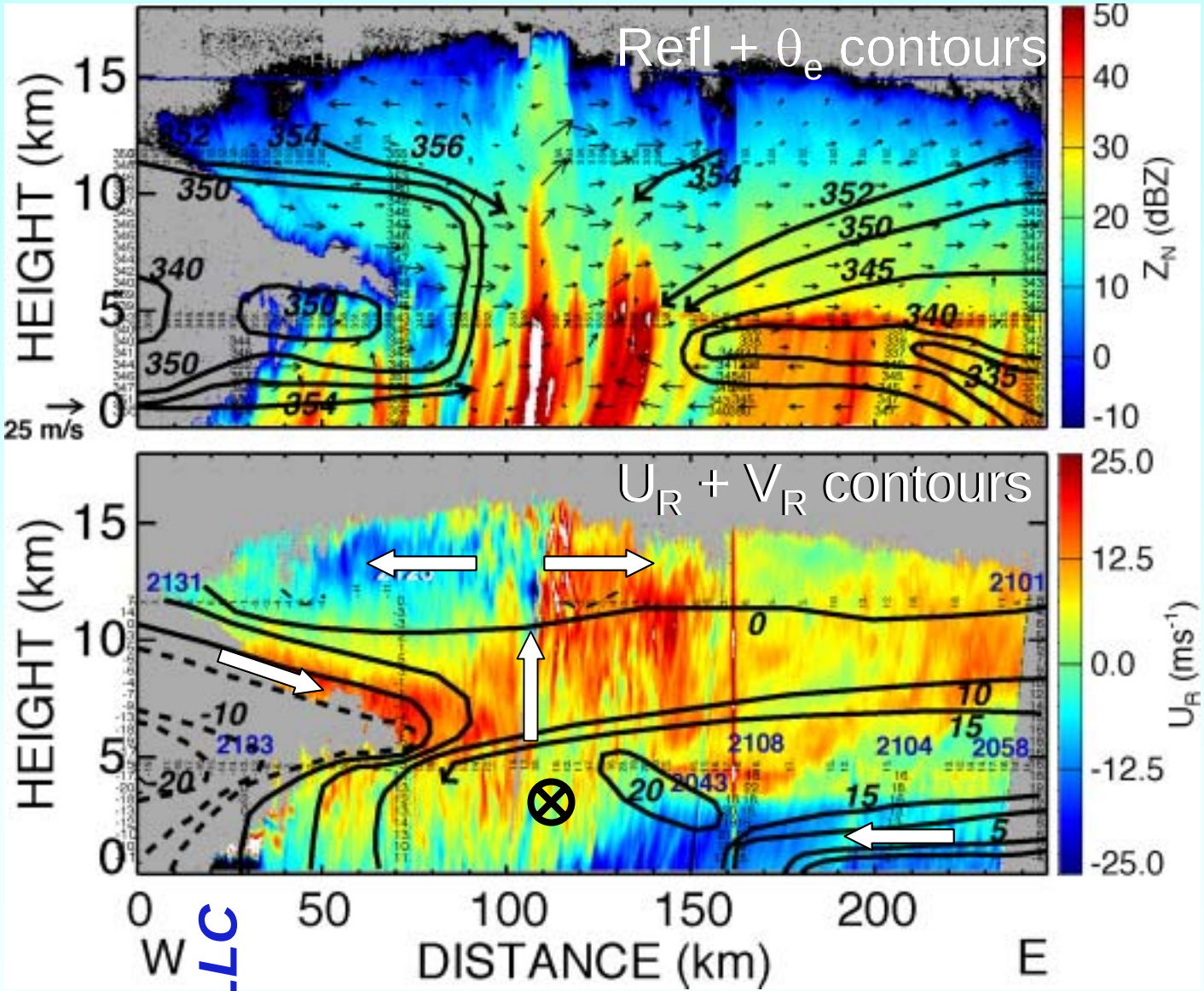


11.5 km altitude



➡ *Upper-level warm core due to high-θ_e air lifted from PBL. This warm core is significantly displaced from LLC.*

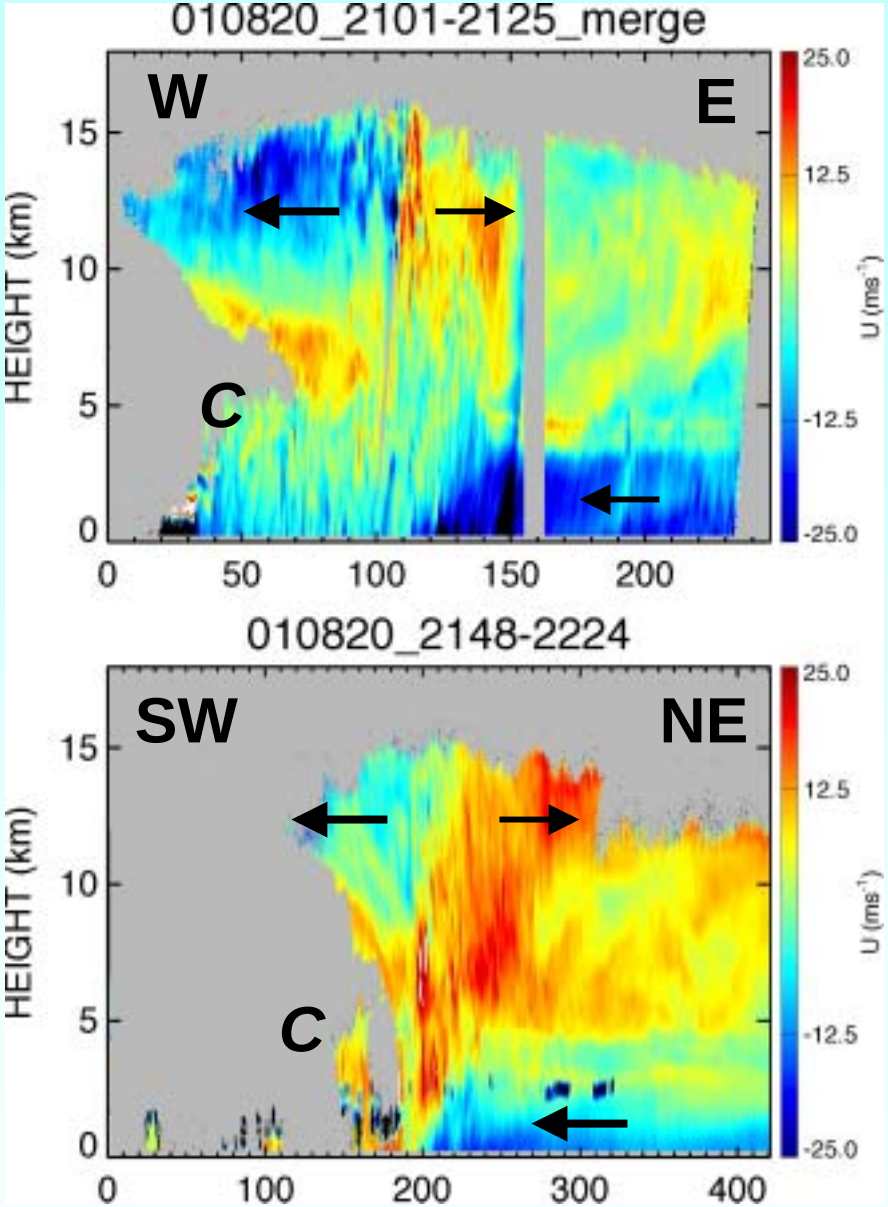
East-West Cross Section



➡ *Strong cell(s) forced at rain-cooled easterly flow boundary.*

TS Chantal Flight 20 Aug 2001

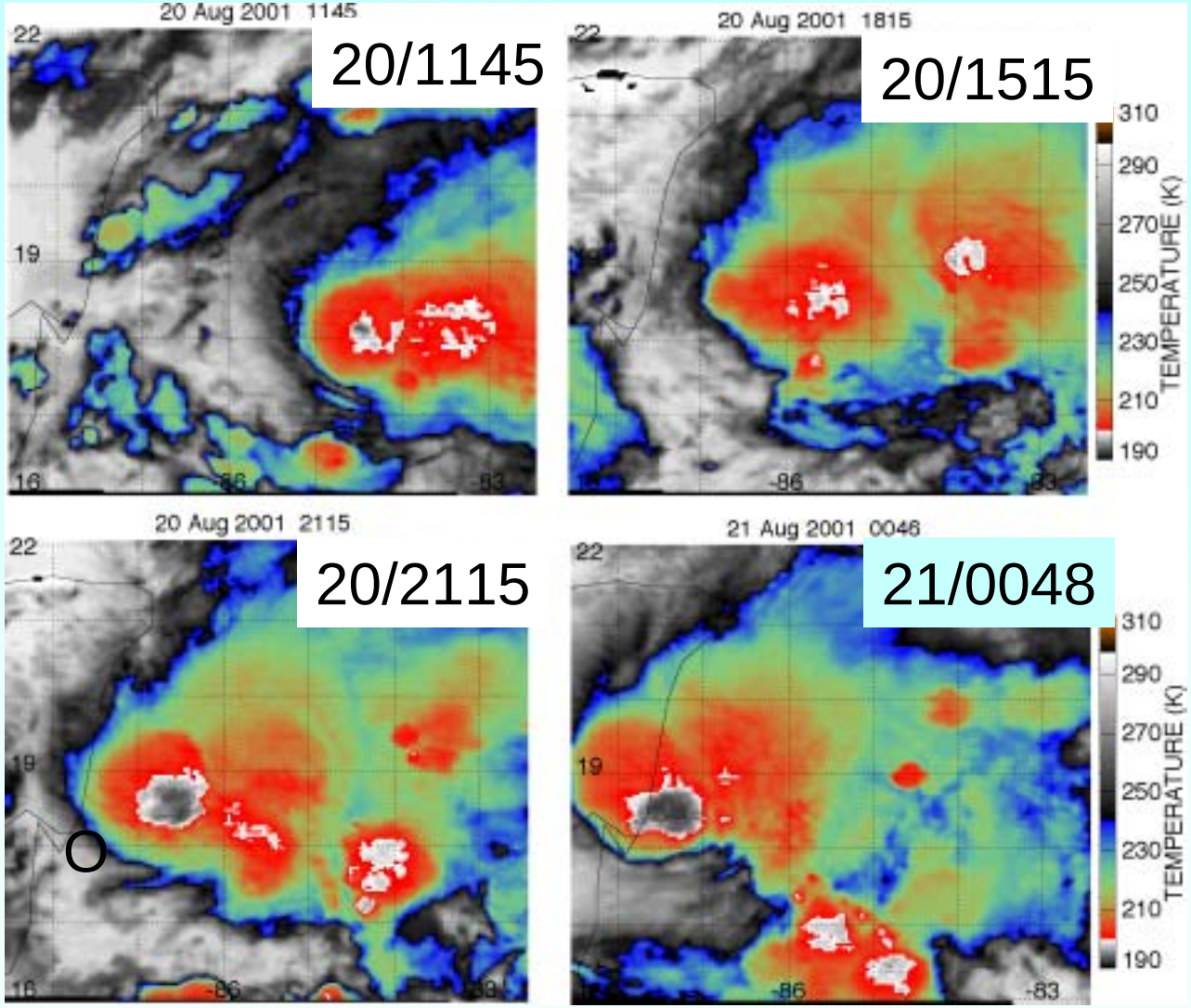
- Coordinated QPE mission with ER-2, DC-8, & NOAA-42.
- Strong E-NE shear, convection formed downshear left.
- Convective burst episode: ER-2 overflew convective burst and DC-8 penetrated it.
- Dropsondes: DC-8 (7) and P3 (23) focused on eastern half of storm.
- Significant vertical motions at DC-8 altitude.
- TRMM pass at 2034 UTC.



Divergence

- Intense mesoscale outflow associated with convection.
- *Divergent region extends over low-level circulation.*
- Subsidence below western side of divergent outflow in radar and dropsondes.

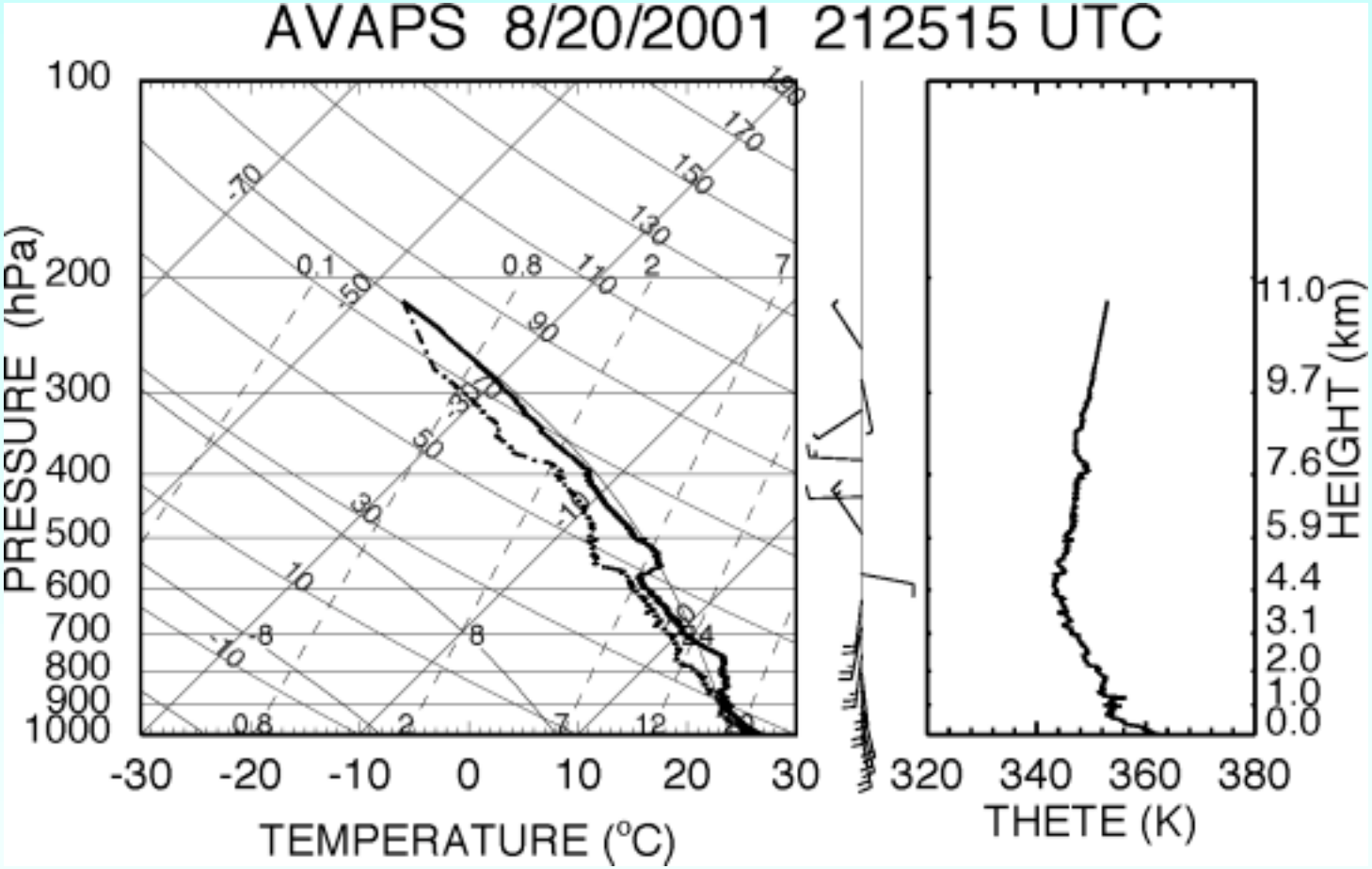
TS Chantal GOES

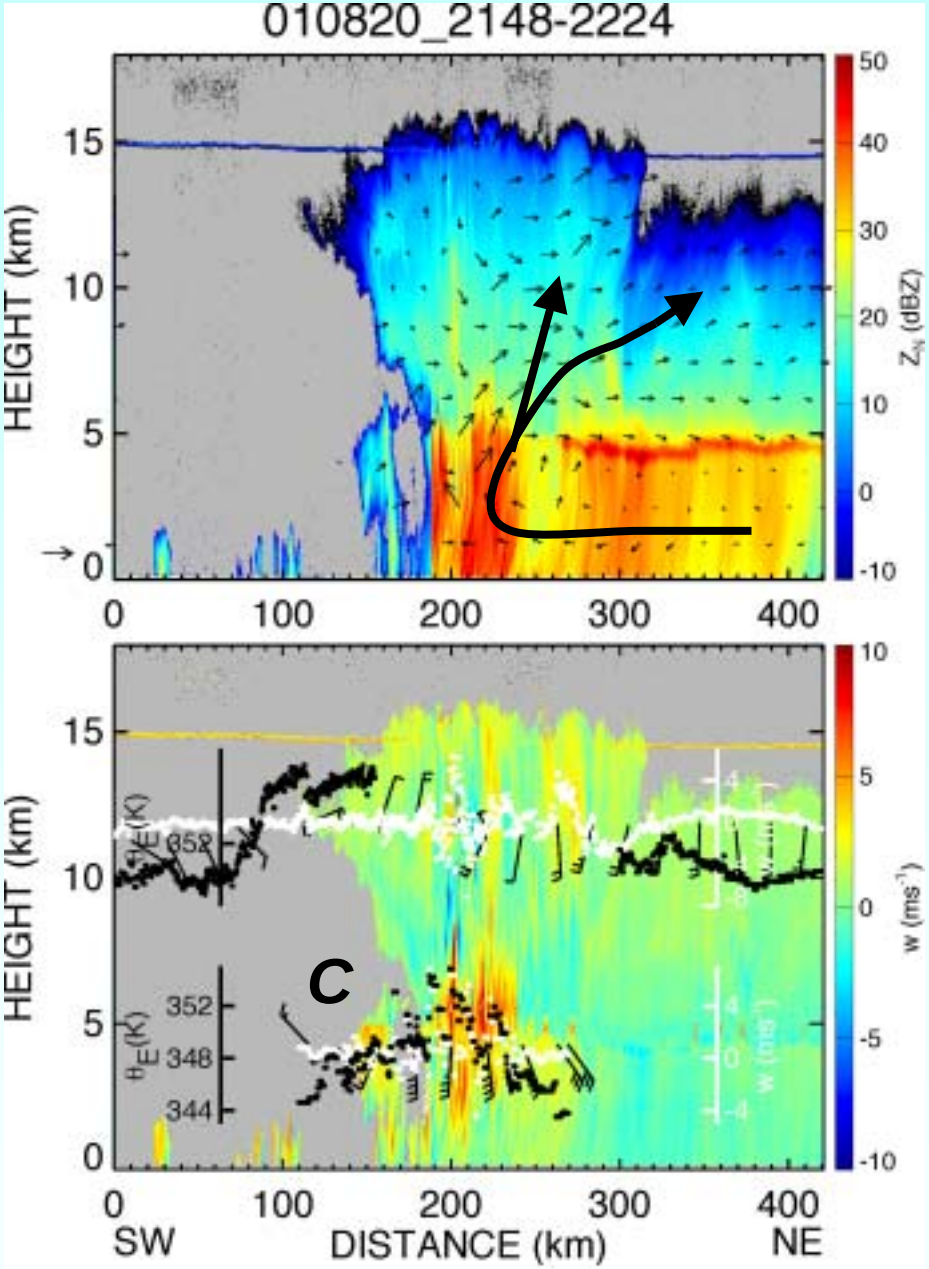


Convection During Aircraft Flights
20 Aug 2002, 2000 - 2345 UTC

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

Dropsonde Near Circulation Center





TS Chantal SE to NW Section

Chantal Summary

- Low level circulation in Chantal appears to be decoupled from intense downshear convection.
- *Convective burst during aircraft flights resembles in some respects MCSs with rear inflow.*
- Strong subsidence observed over circulation center (upshear) not favorable for storm development and consistent with Ritchie and Elsberry (2001) results.
- *Future: complete observational study and to provide data for modeling comparison.*