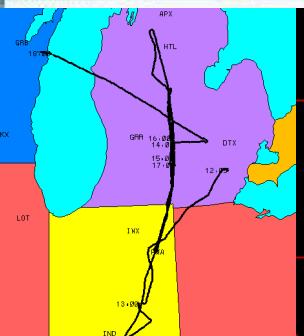
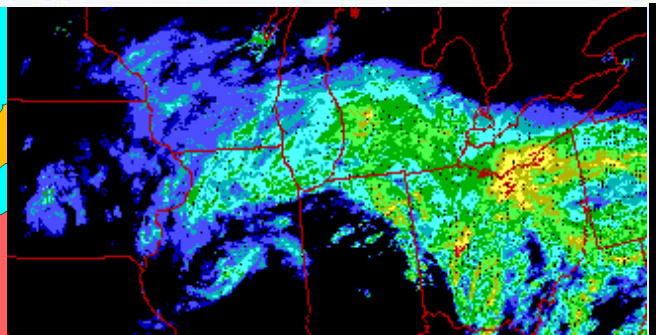
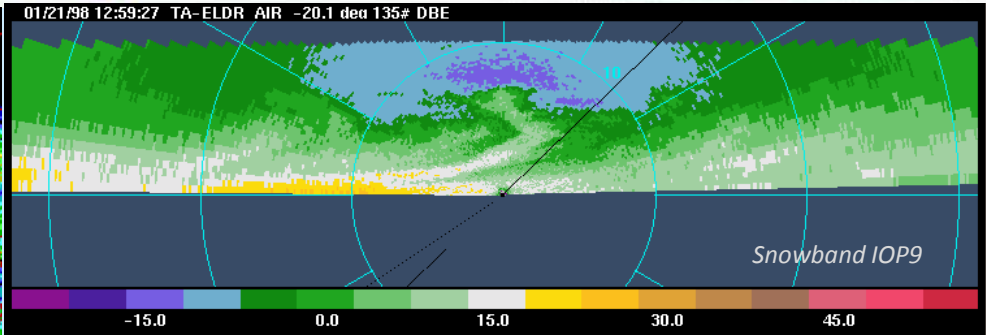
Snowband IOP2

Modeling efforts and objectives: PLOWS 2009-10

Brian Jewett



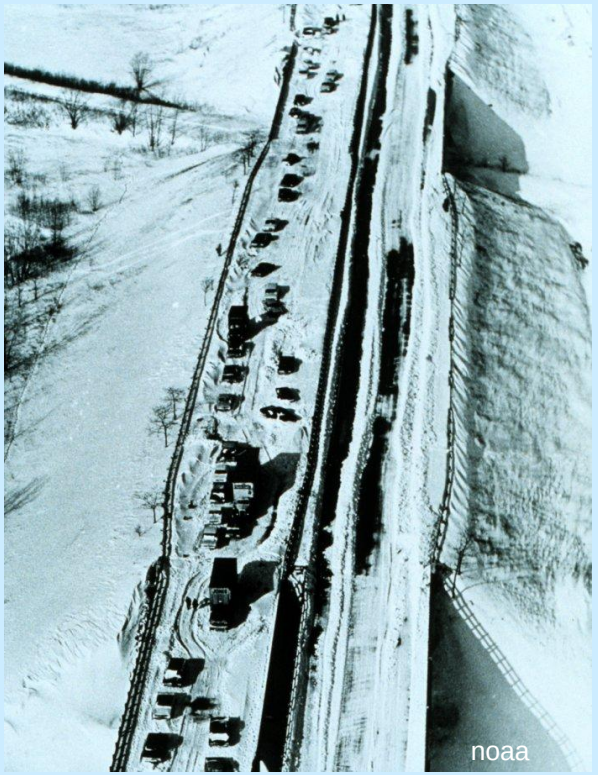




Modeling objectives

1. Forecasting objectives (later: 10am)

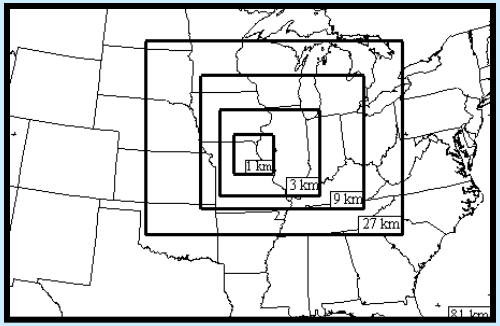
2. Research objectives:
   - Modeling fine-scale snowbands
   - Comparison to PlOWS field observations
   - Improved understanding



Chicago, 1967

Getting there

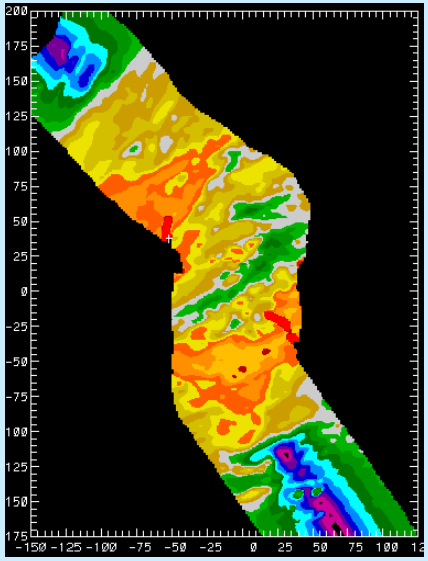
- We will -
  - First simulate the entire cyclone structure down to scale of individual fine snowbands*
  - SNOWBAND modeling efforts revealed a need for extremely high resolution – particularly in the *vertical* dimension



*easier said than done!

Modeling and observations

- We will assess the degree to which WRF simulations reproduce band structures and behavior measured by PLOWS airborne and ground-based platforms
  - How should we quantify and compare obs to model results?
  - Compare scale, intensity, longevity
  - Utilize methods from *BAMEX,* incl. statistical measures to complement traditional measures



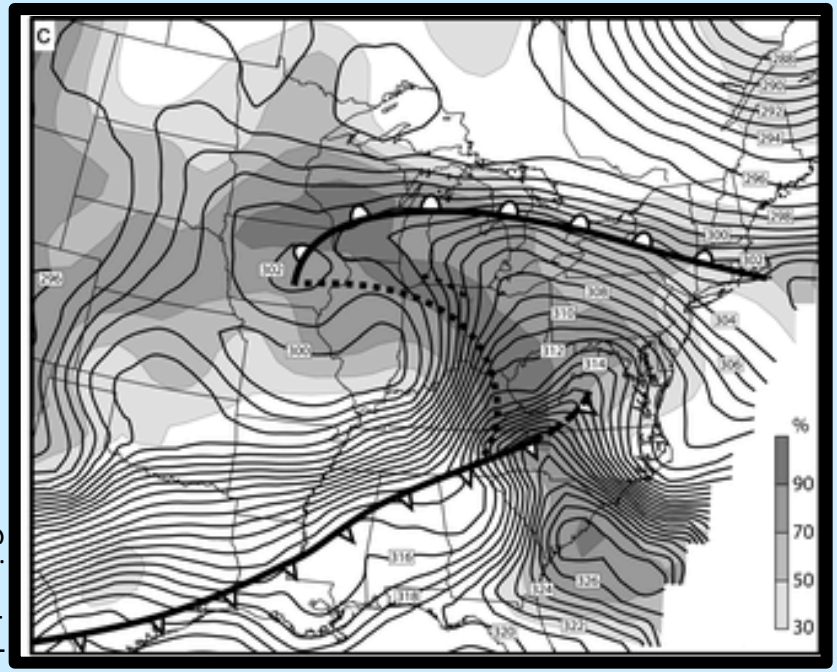
Snowband project

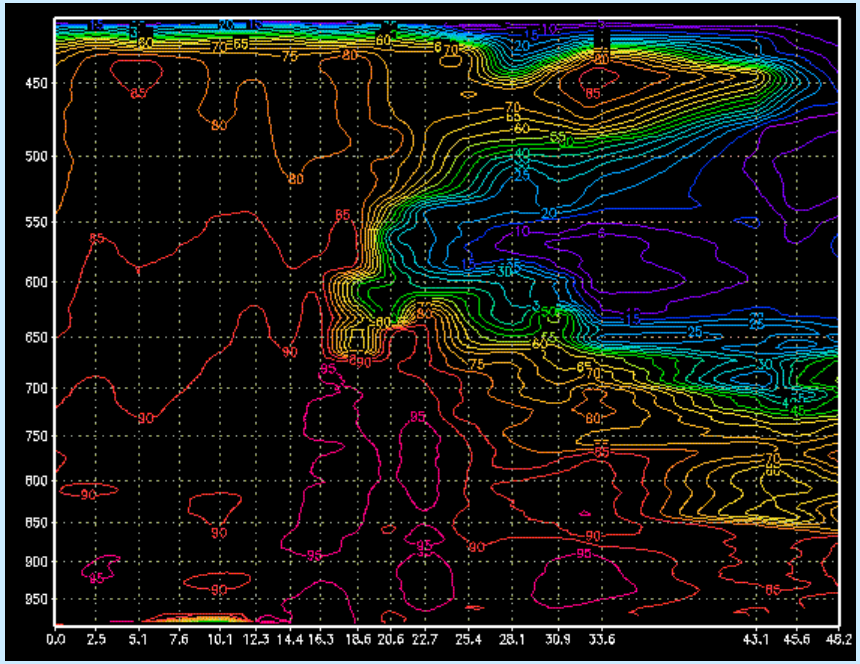
Modeling and observations

- We can use simulations to help interpret observations in the context of the cyclone.
- Observations will be crucial to evaluate the simulations - if we are to trust our findings from the modeling study.
- We are working from several hypotheses; PIOWS observations will inspire more.

Band formation

- Investigate the origins of the instability responsible for band formation





Grim et al.

Band formation

- Investigate the origins of the instability responsible for band formation
- ... Use model trajectories to investigate source regions for air arriving near dry slot boundary, and the properties of that air.
- ... Compare modeled vertical velocities to those determined from PlOWS obs: magnitude, temporal and spatial scales
  (how scale-dependent are the modeled vertical motions?)

Band formation

- Is one instability dominant, or does it vary with cyclone type, origin, intensity?
- Will we see enough variability during PlOWS 2009-10 to draw conclusions? (or will we need to model other cases?)

Band behavior / maintenance

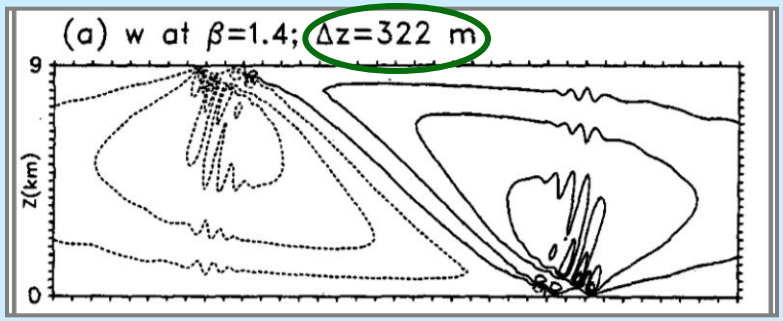
- Do the bands remain tied to the instability responsible for their formation?

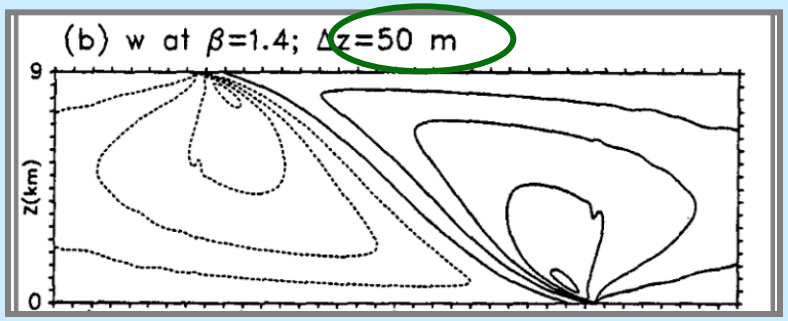
  … Use high temporal and spatial resolution from the model fields to assess the persistence of the instability and relationship to the bands

- Is the initial instability continually regenerated? Periodically restored? Modulated by the bands that develop?

Band propagation

- What is the association between bands & gravity waves?
- We will compare modeled band structure *and movement* to (1) obs and (2) theory
- We will need extraordinary resolution to avoid spurious gravity waves.



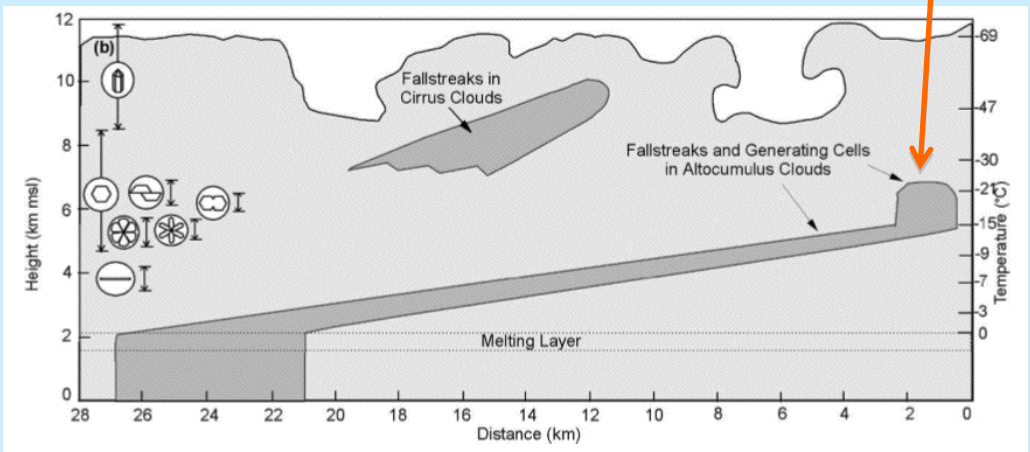


Snyder et al.

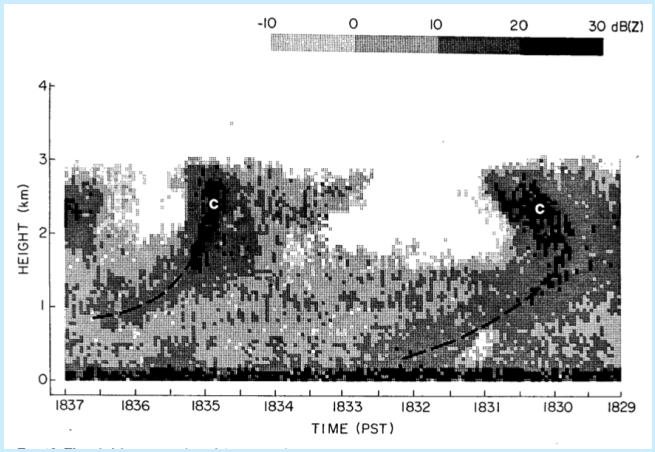
Fine-scale bands

- We seek to model generating cells within the larger wraparound region

cell shown is 2 km wide, 1 km tall.



Evans et al. 2005



Businger & Hobbs 1987