Terrain-influenced Microphysical Processes Observed by Dual-polarization Radar during OLYMPEX

Angela Rowe

Robert A. Houze, Jr.

University of Washington, Seattle, WA

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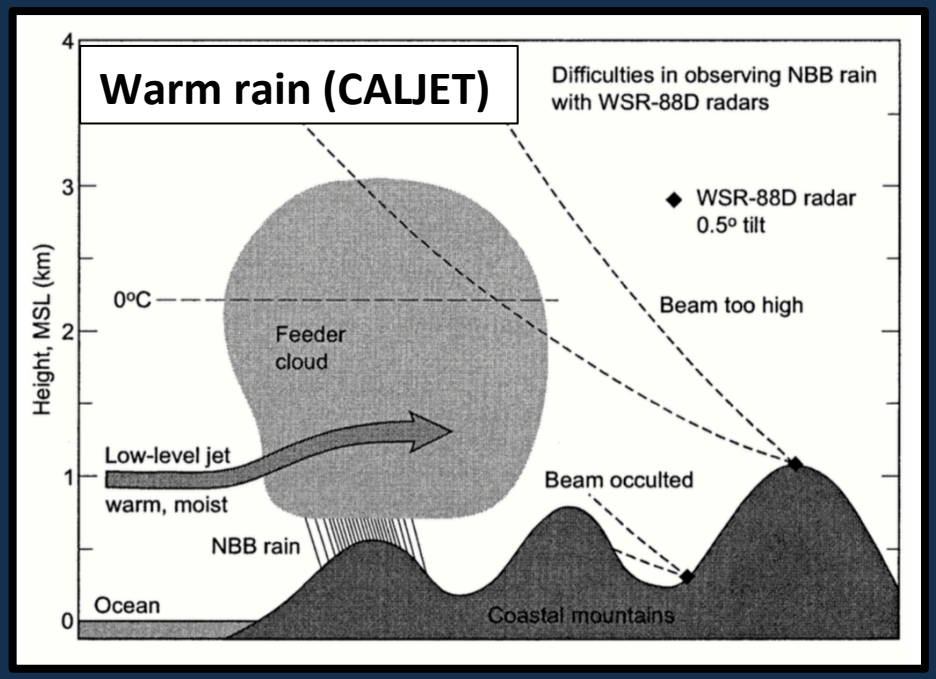
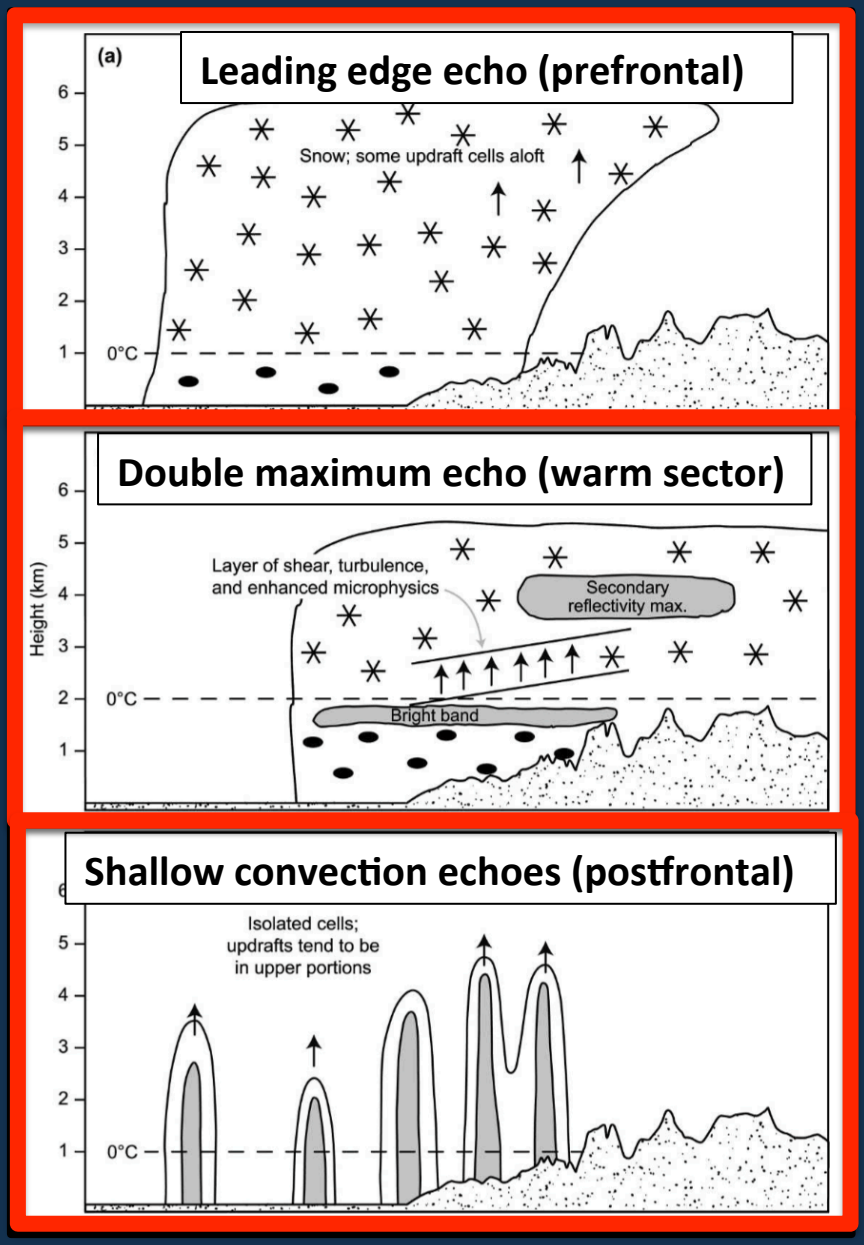
Orographic Precipitation Processes



White et al. (2003)

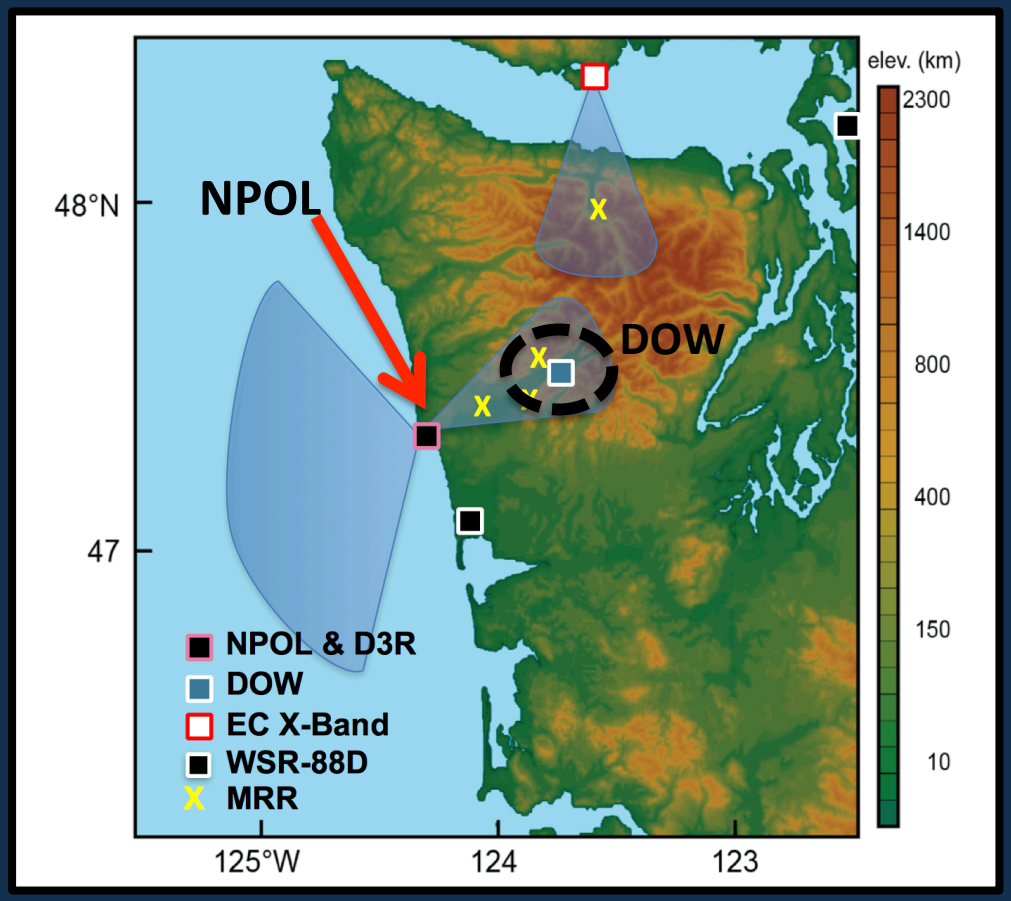
Hybrid*, bright band, non-bright band

NBB: 28% total rain (inferred small drops)



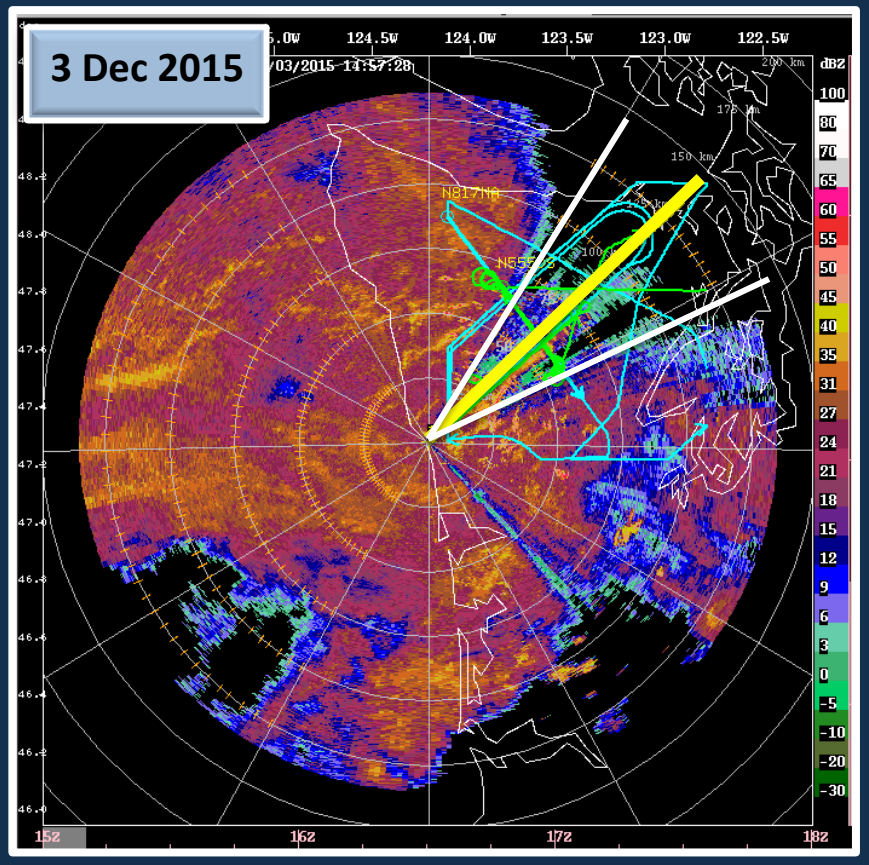
Medina et al. (2007)

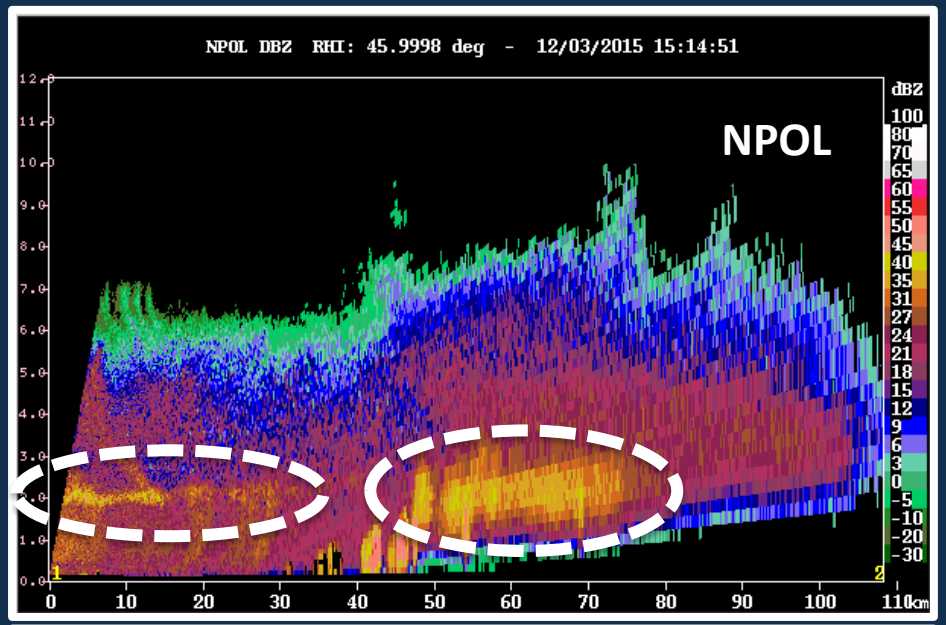
OLYMPEX radar network

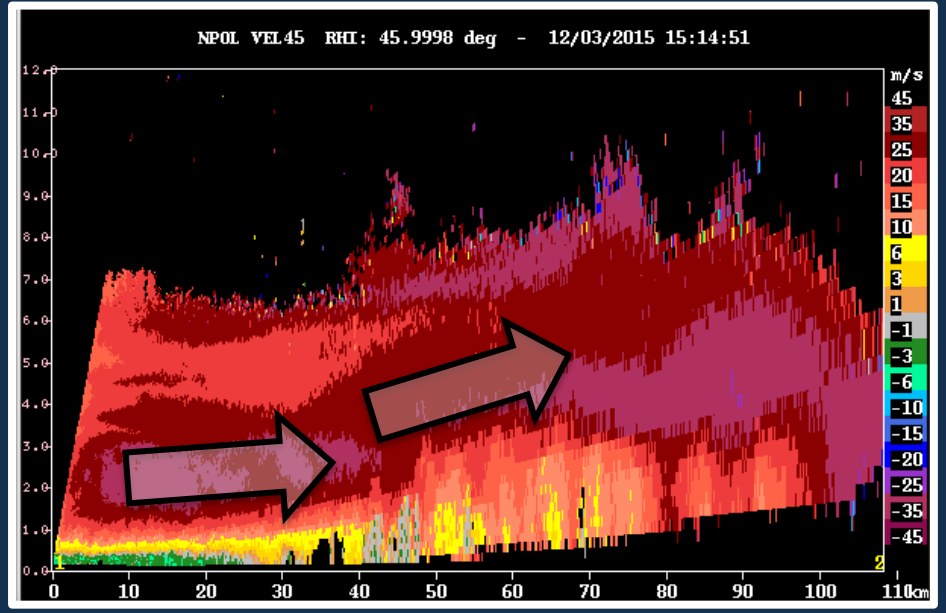


- How do microphysical and dynamical processes change as storms move from ocean to coast to windward to leeside?
- How do these processes vary between storm sectors?
- Under what circumstances does orographic enhancement of precipitation occur? Which processes are responsible?
- Relative roles of warm-rain and ice-based processes

Orographic Enhancement







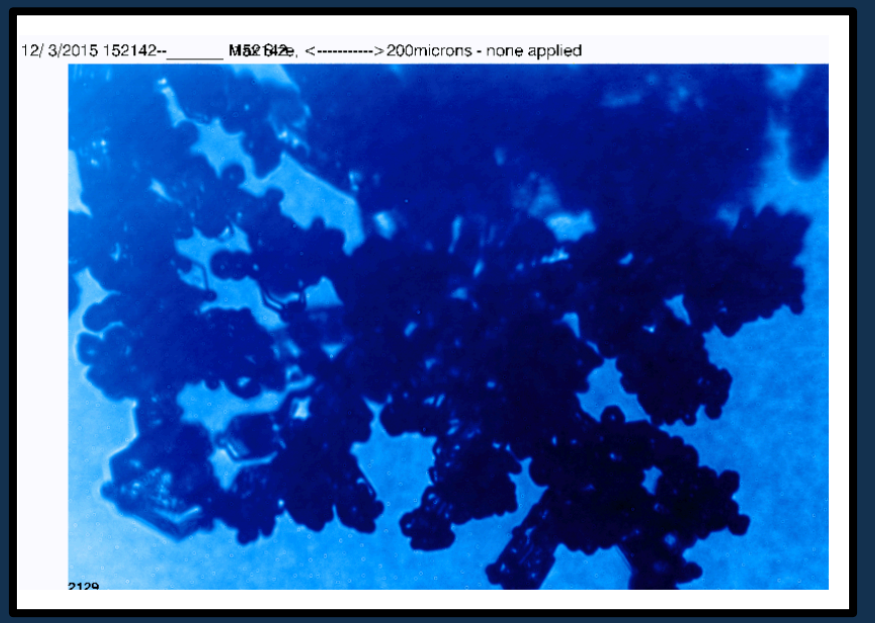
RHI (valley) sector

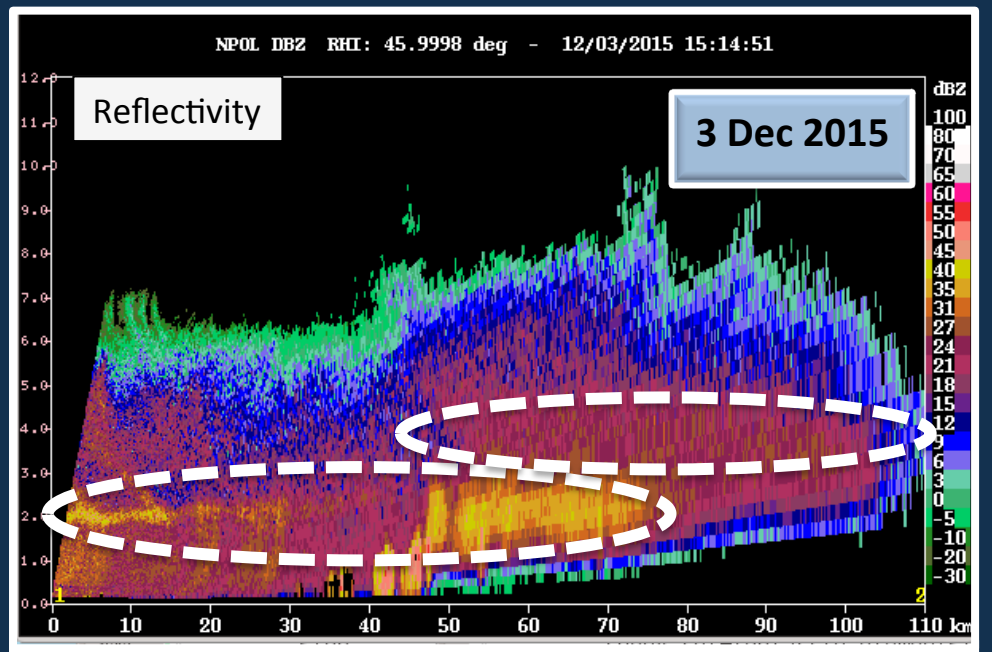
DC-8

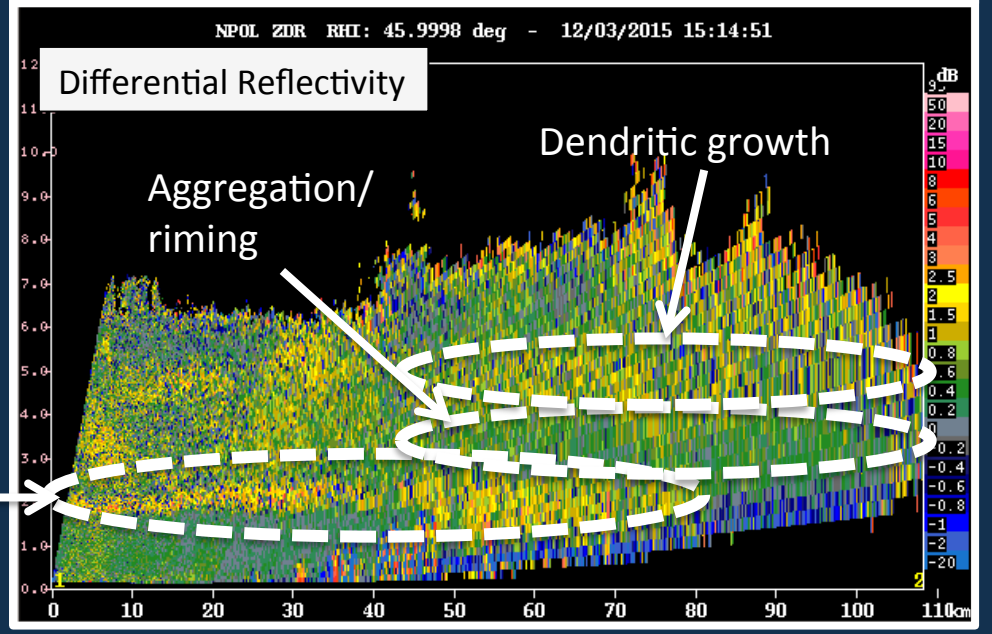
Citation

Orographic Enhancement

UND Citation cloud particle imager (4 km):
Rimed, branched, and aggregated snow

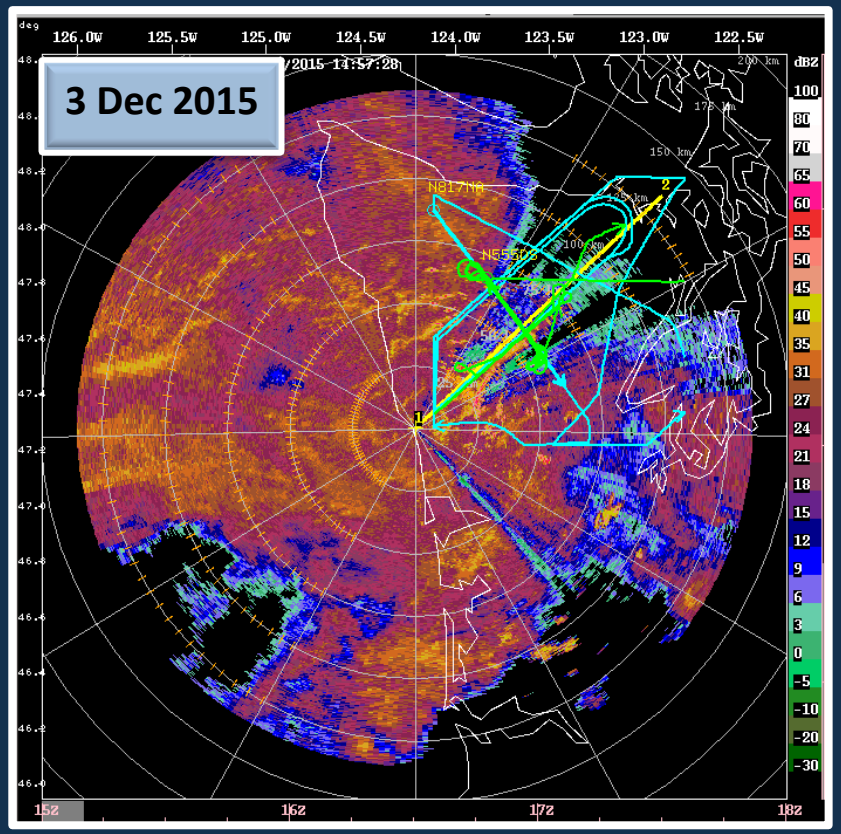


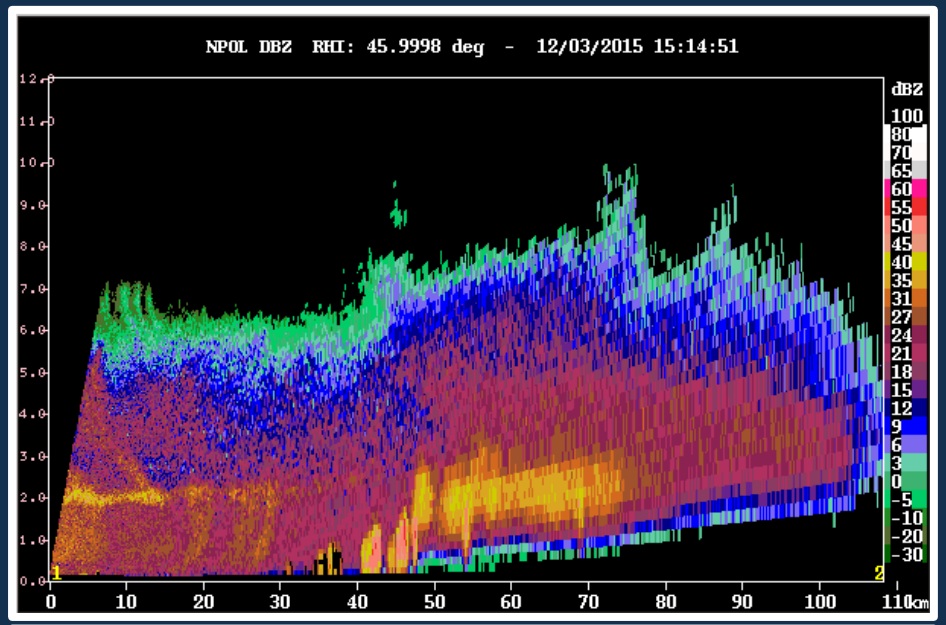


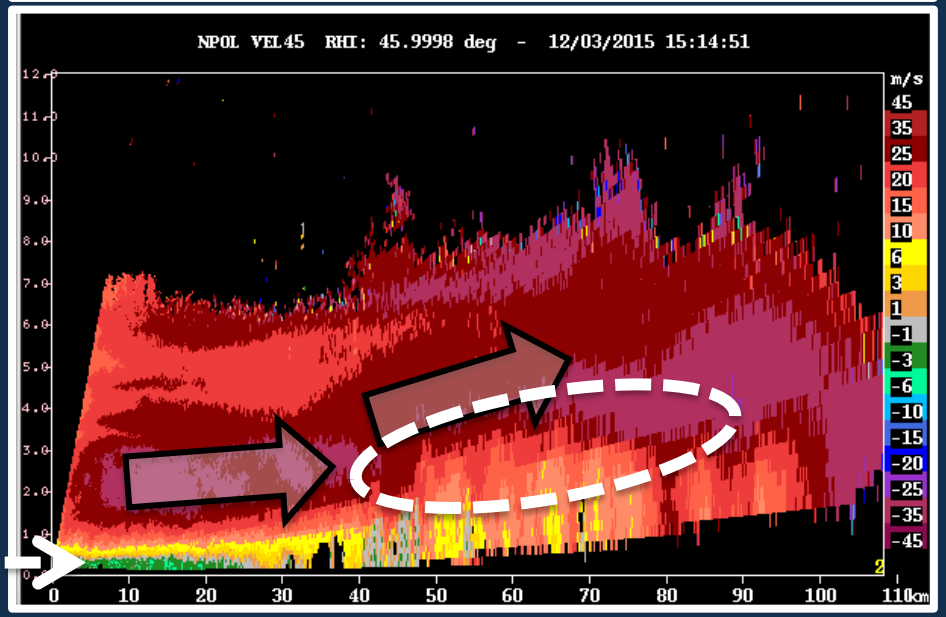


Snow melting to rain

Orographic Enhancement

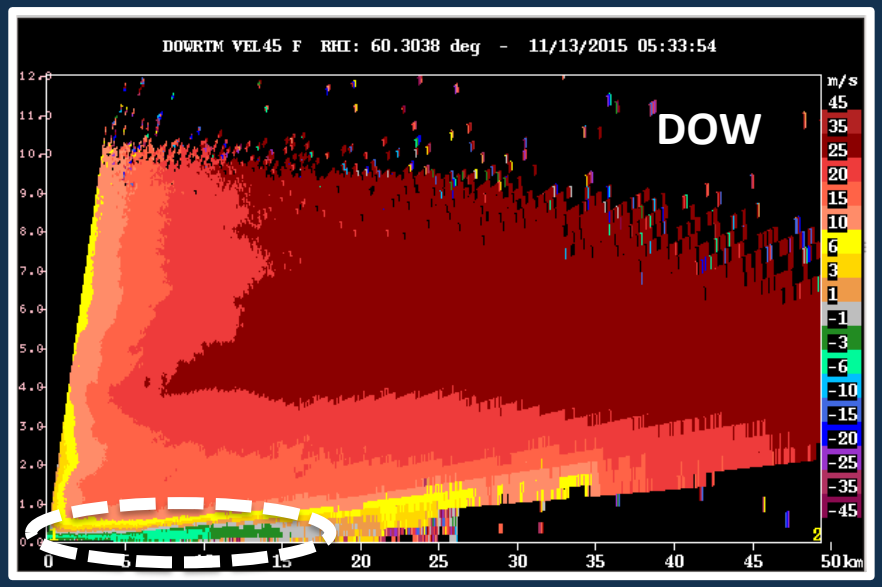


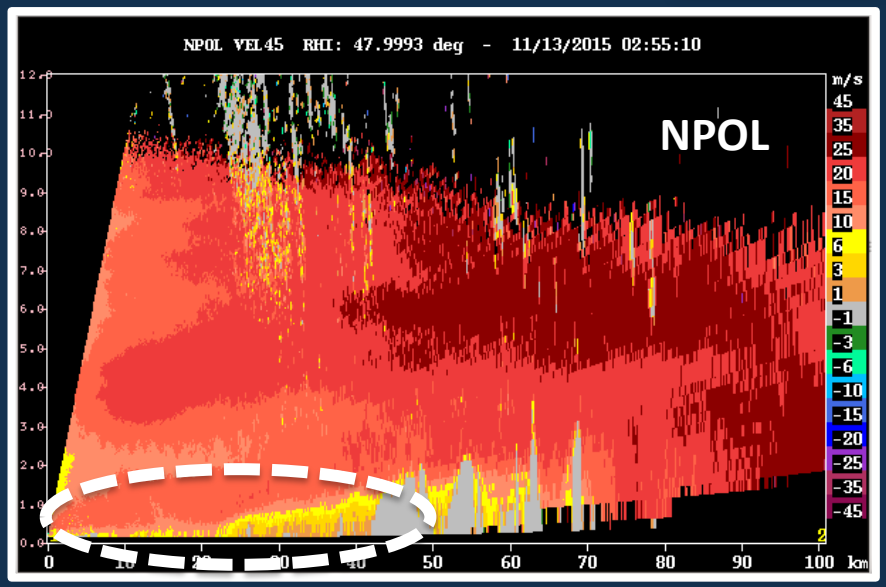




Down-valley low-level flow

13 Nov



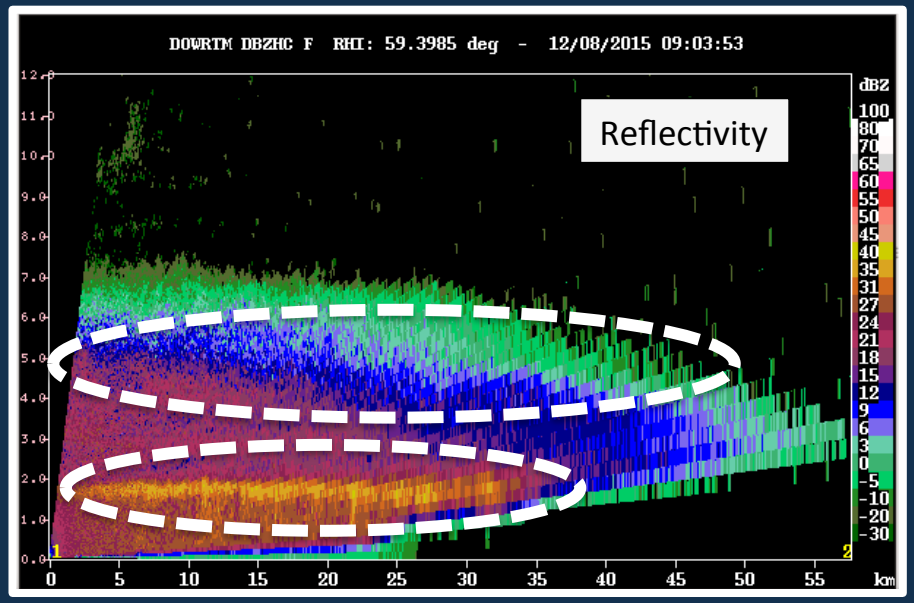


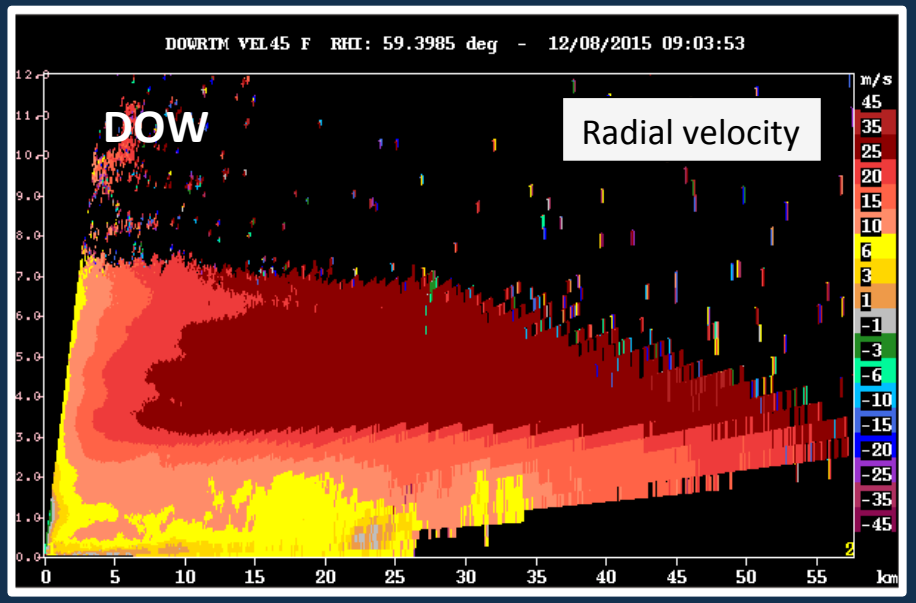
- Also observed during MAP, SNOW-V10
- Diabatic cooling from evaporation and melting snow, formation of down-valley flow (Thériault et al. 2012)

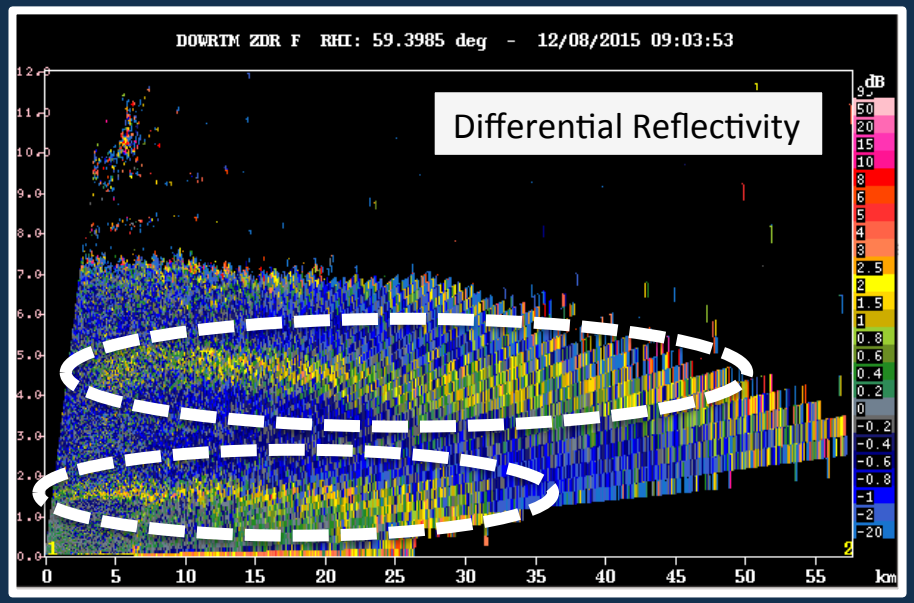
- How does this flow pattern vary?
- What is the effect on microphysics?

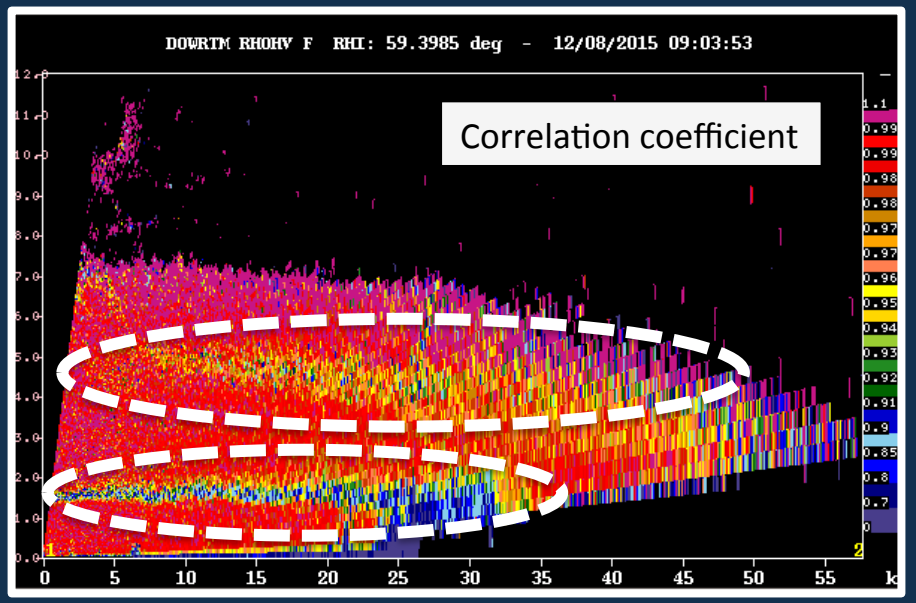
Atmospheric River Event

8 Dec









Atmospheric River Event

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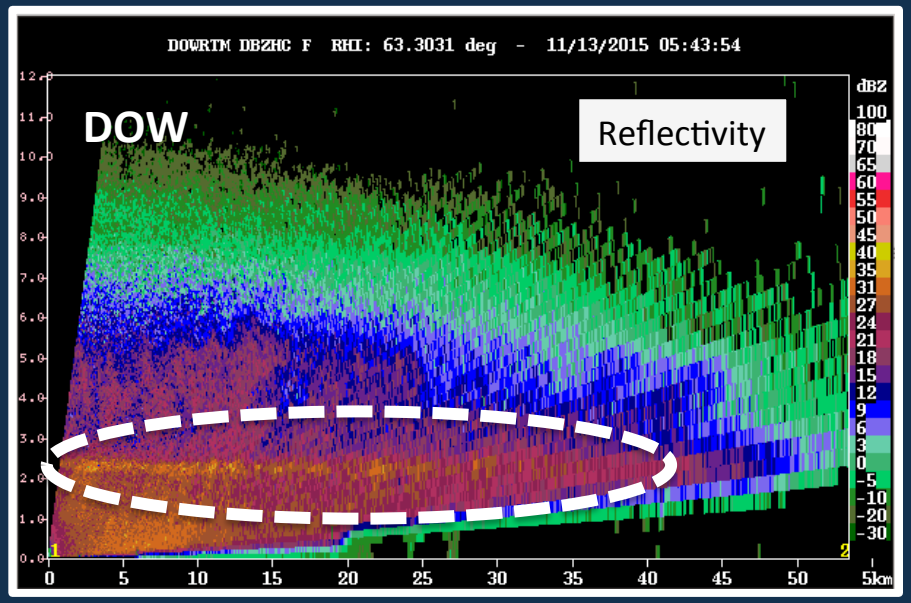
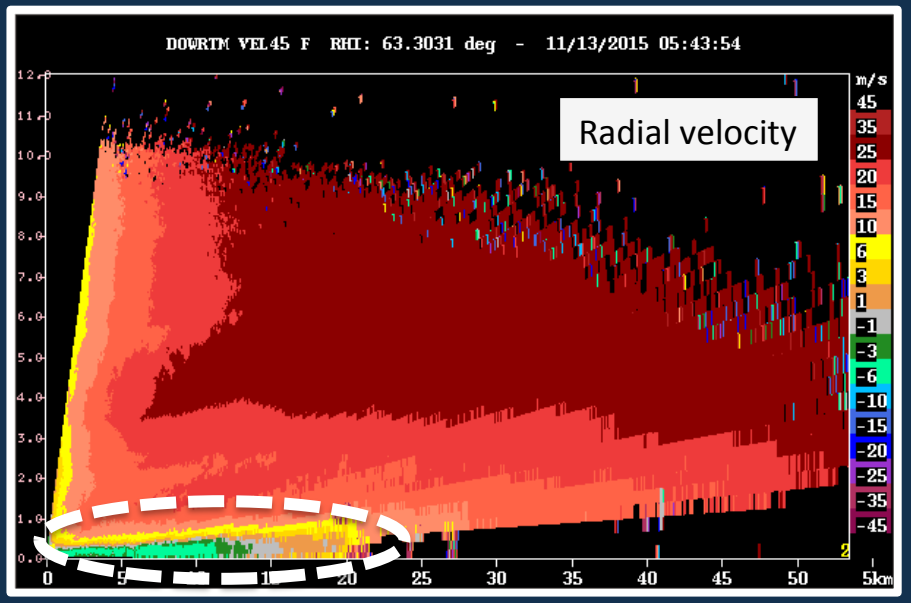
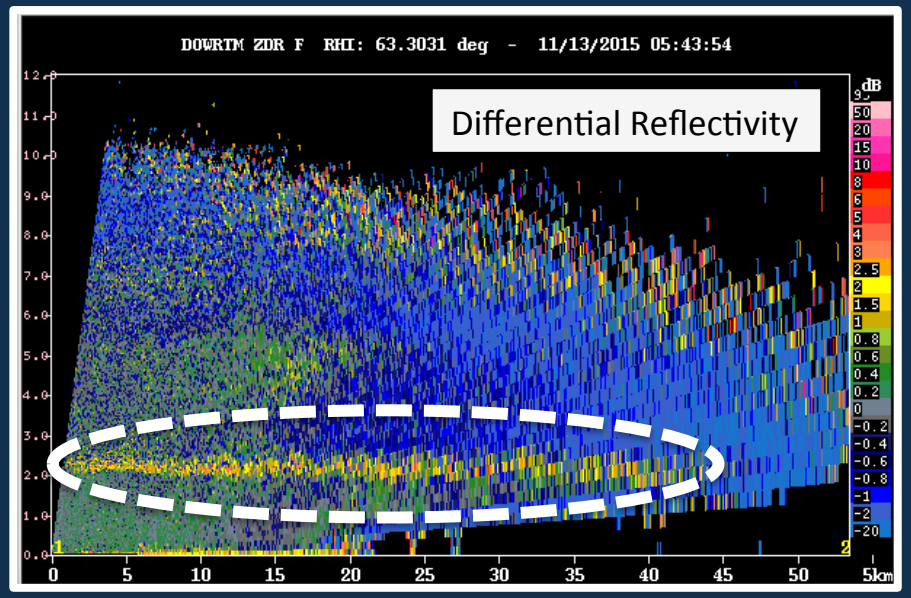
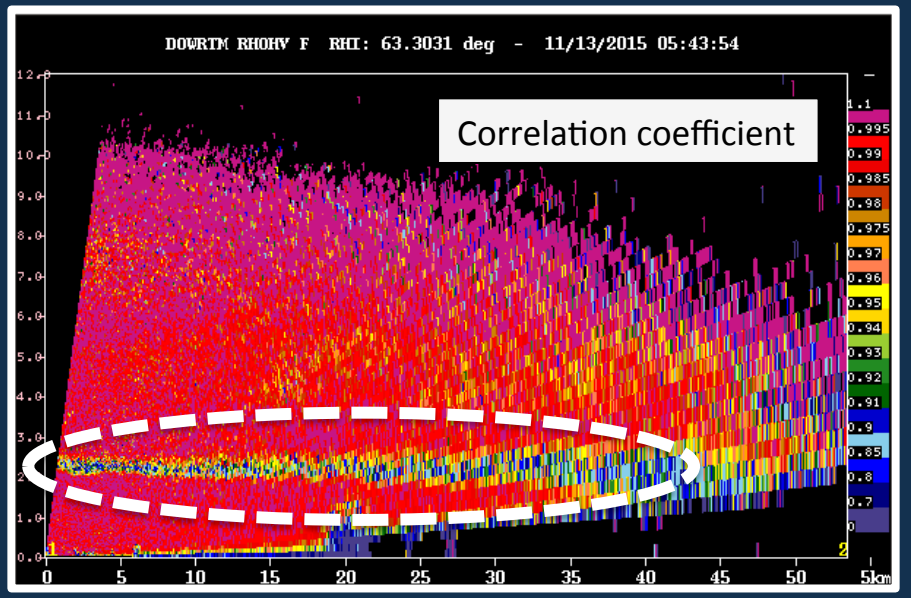


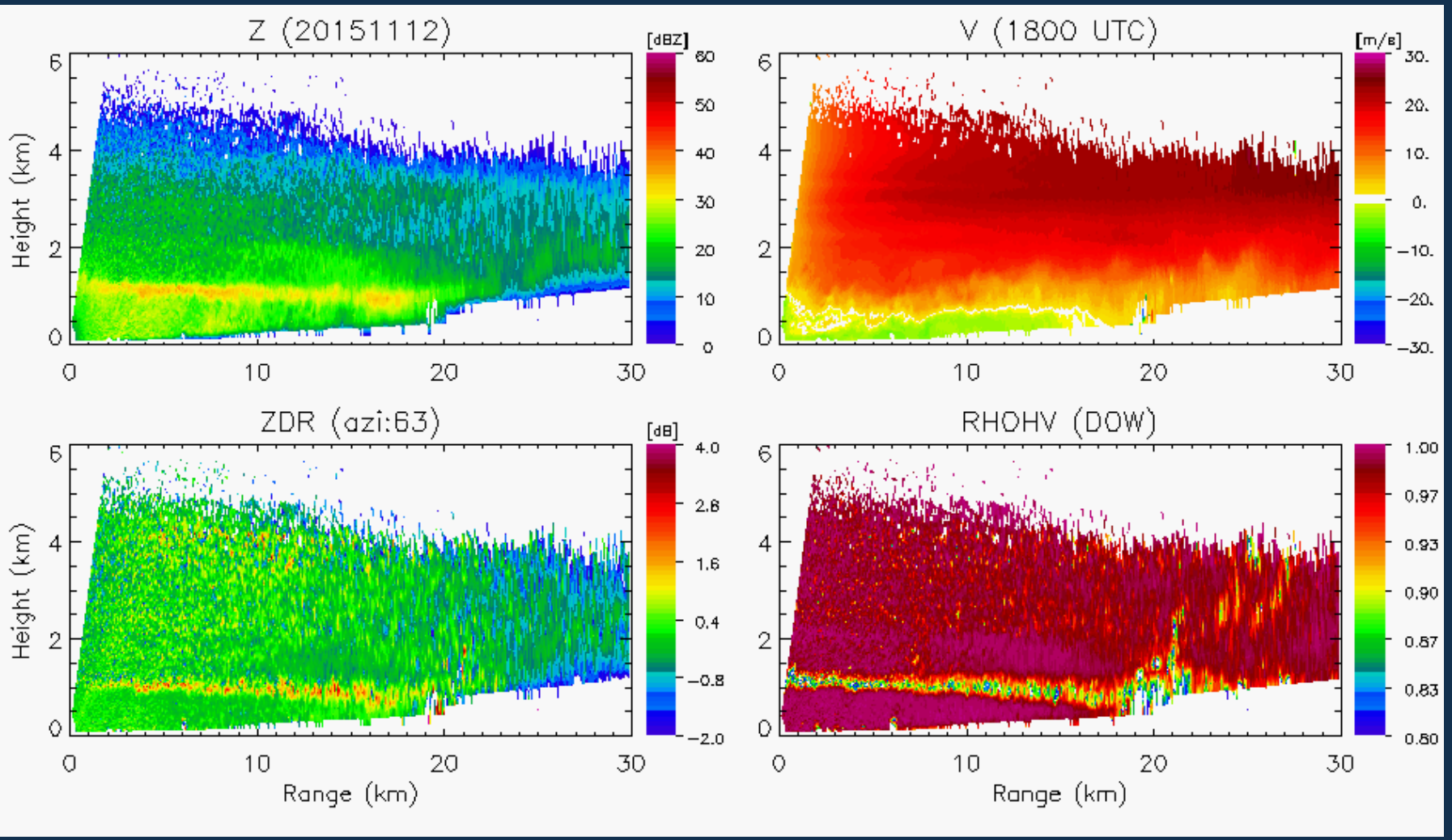






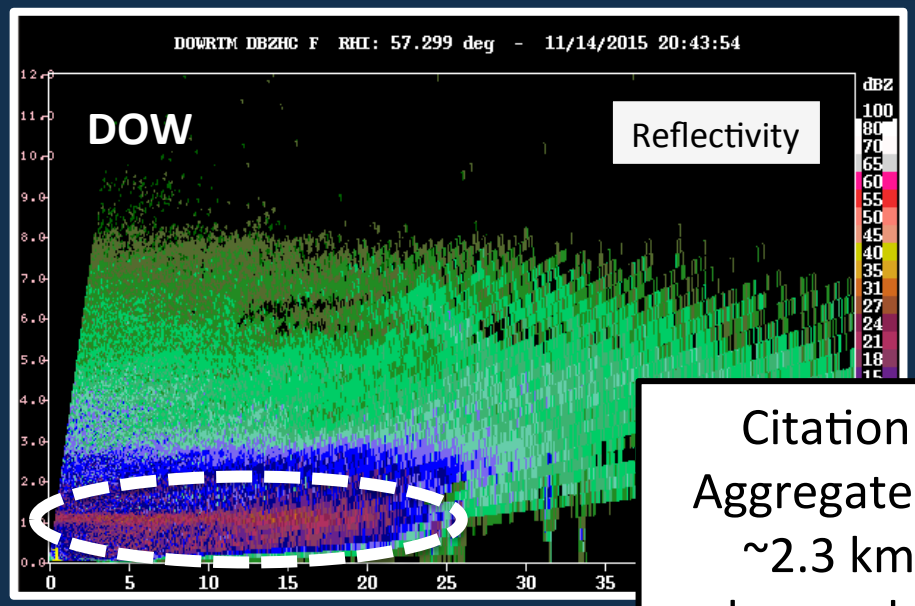
Atmospheric River Event

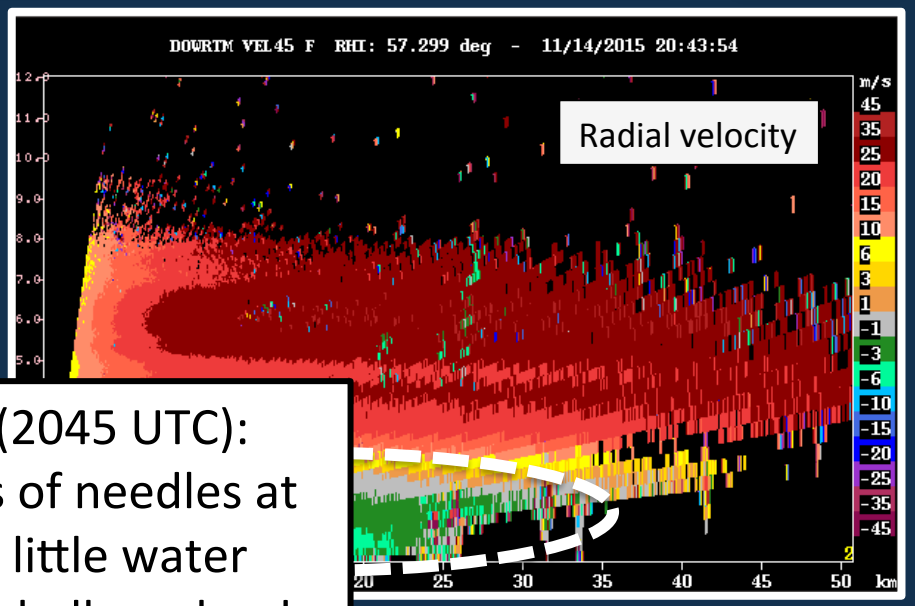
12-13 Nov



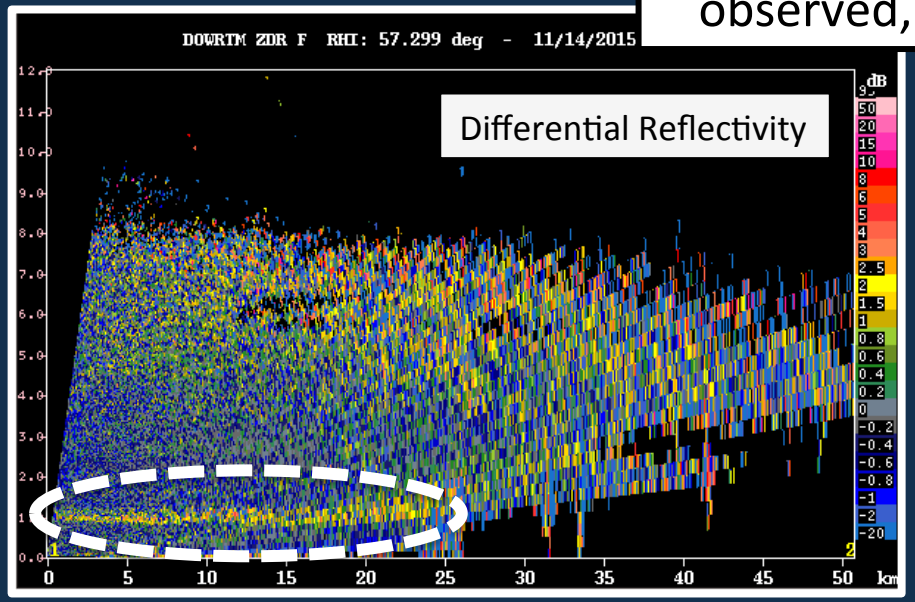
Large-scale easterly flow

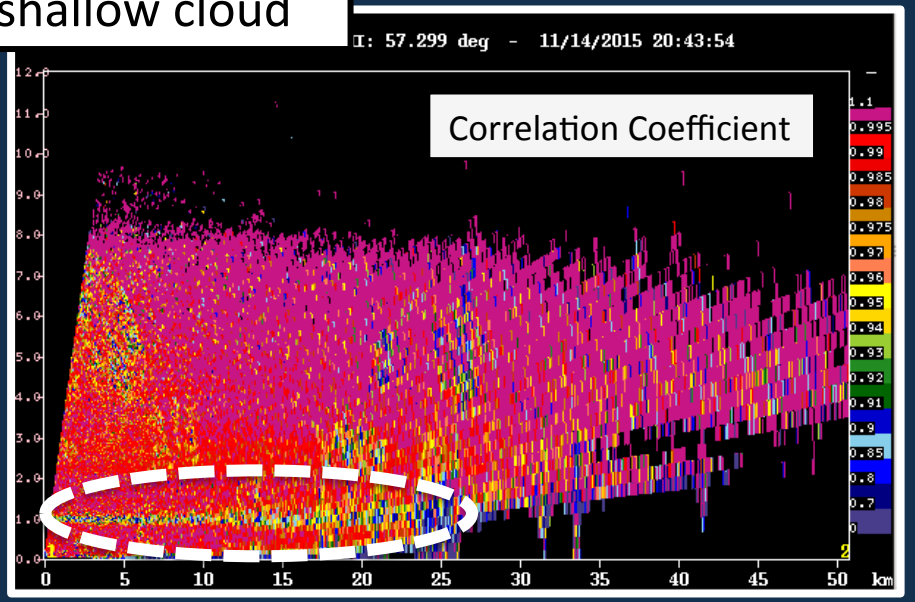
14 Nov





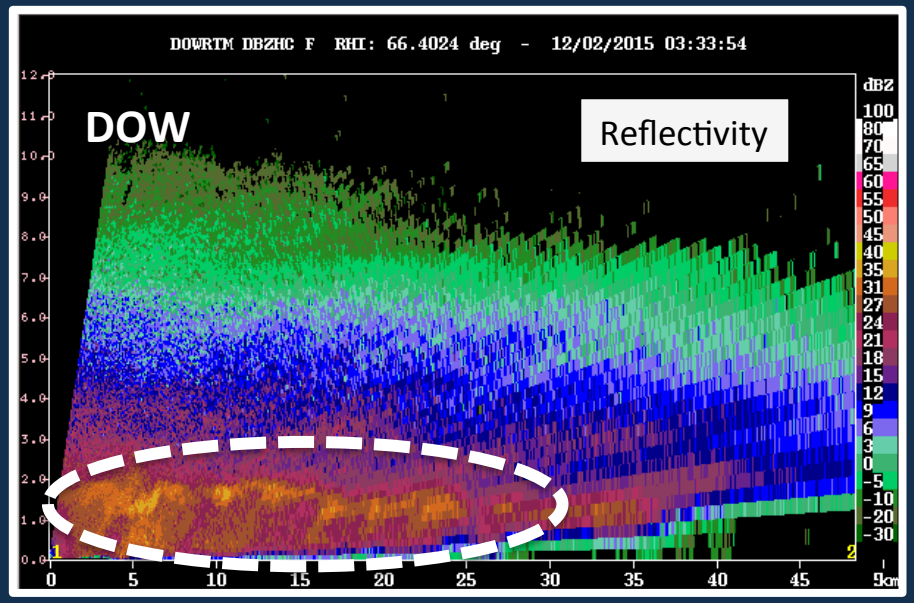
Citation (2045 UTC): Aggregates of needles at ~2.3 km, little water observed, shallow cloud

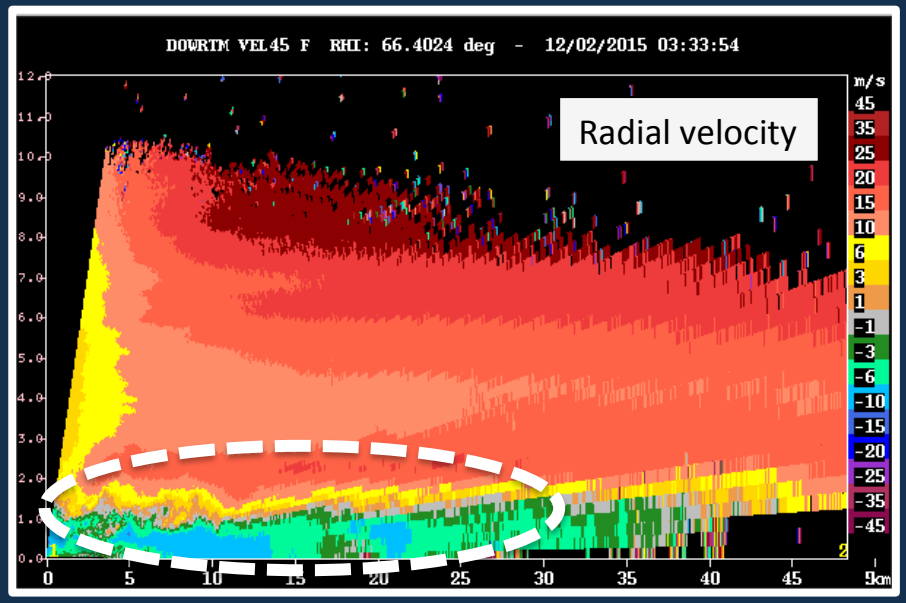


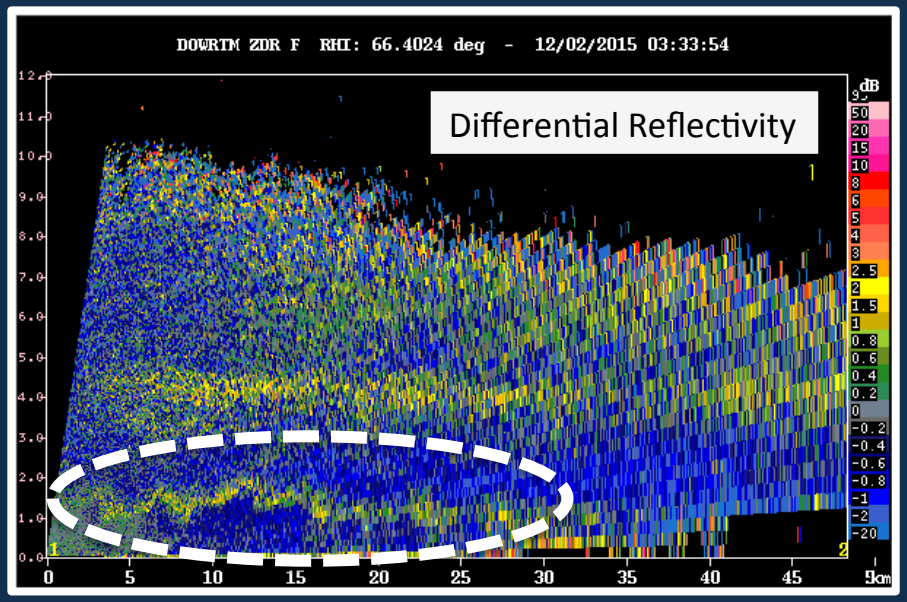


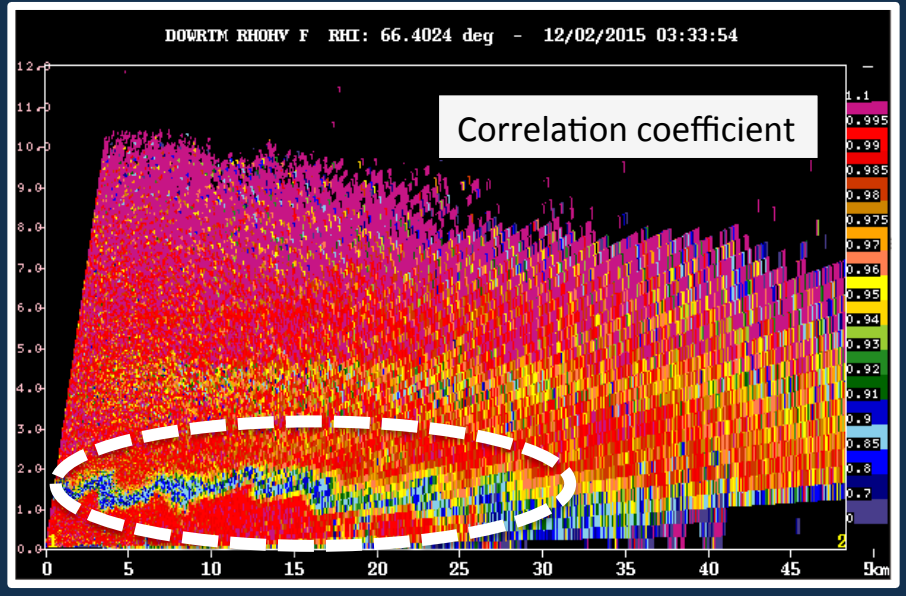
Frontal passage

1-2 Dec



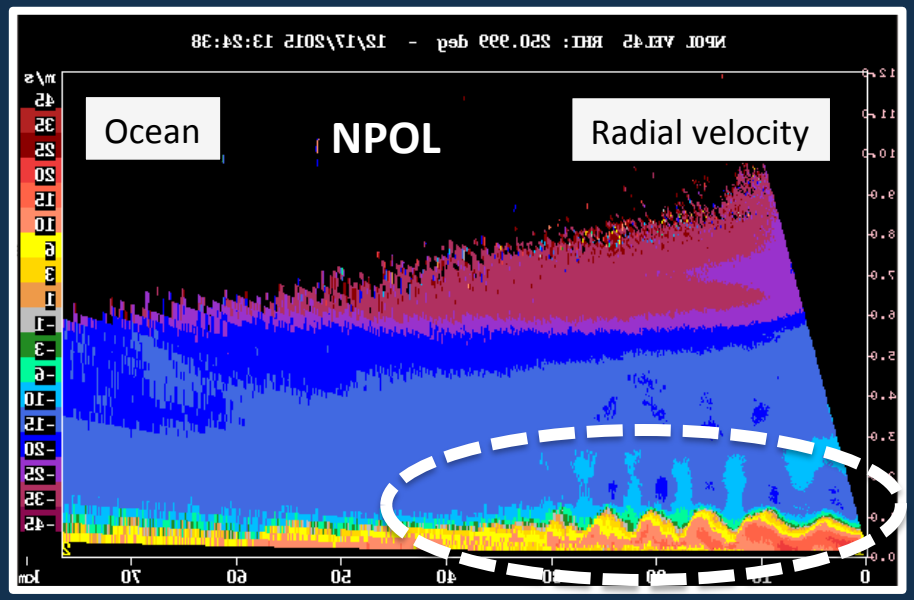


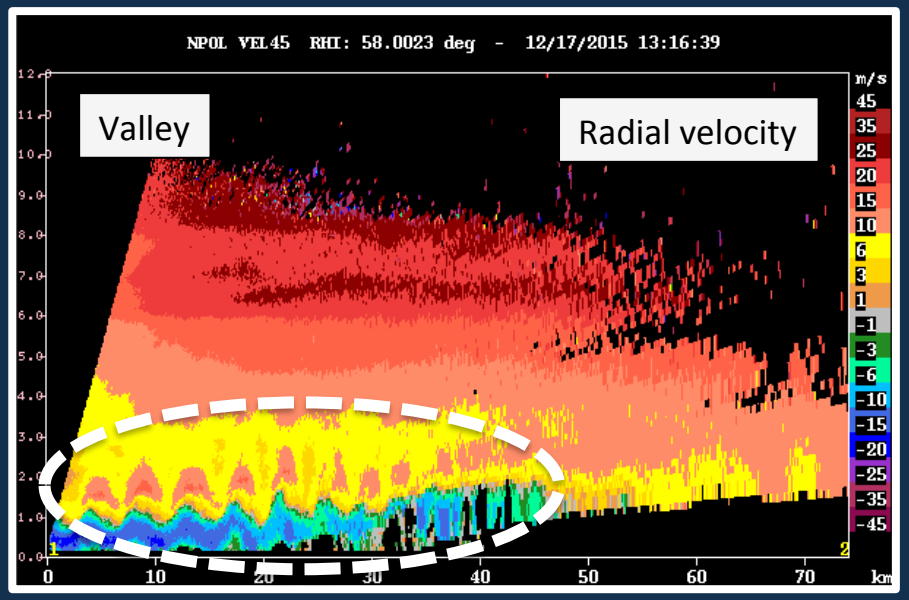


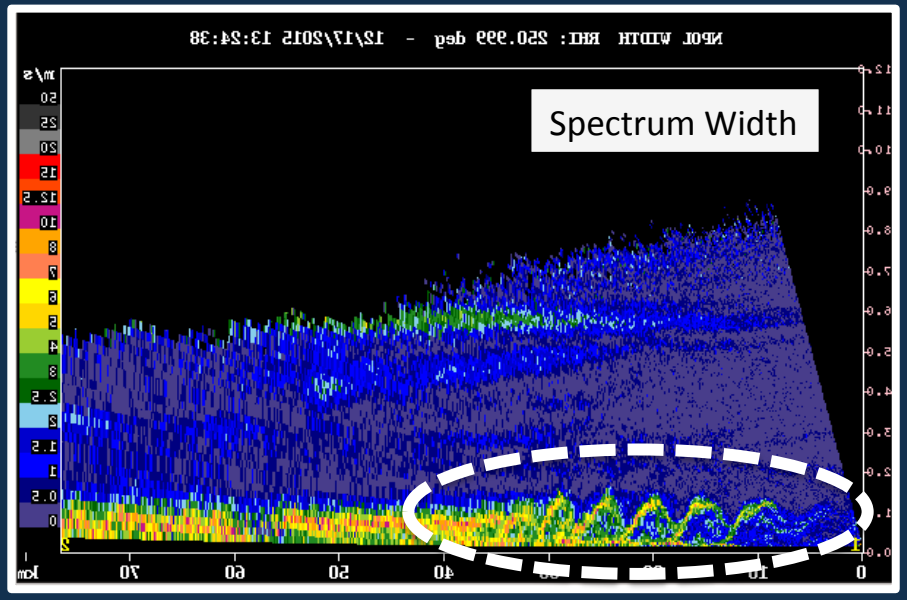


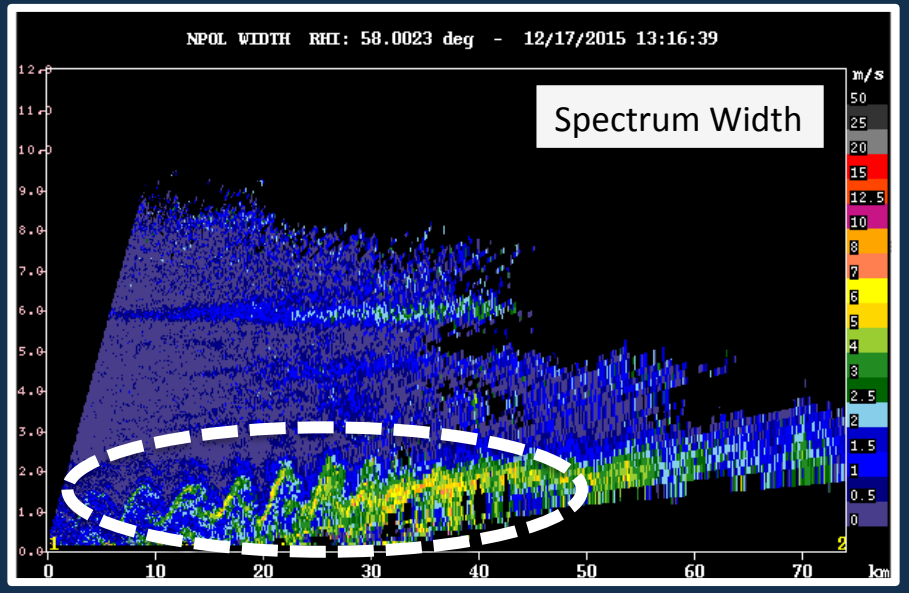
Kelvin-Helmholtz waves

17 Dec



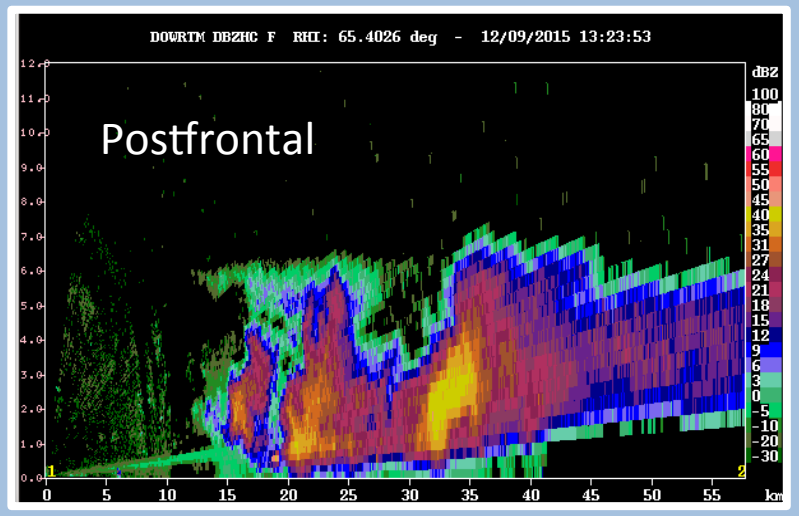


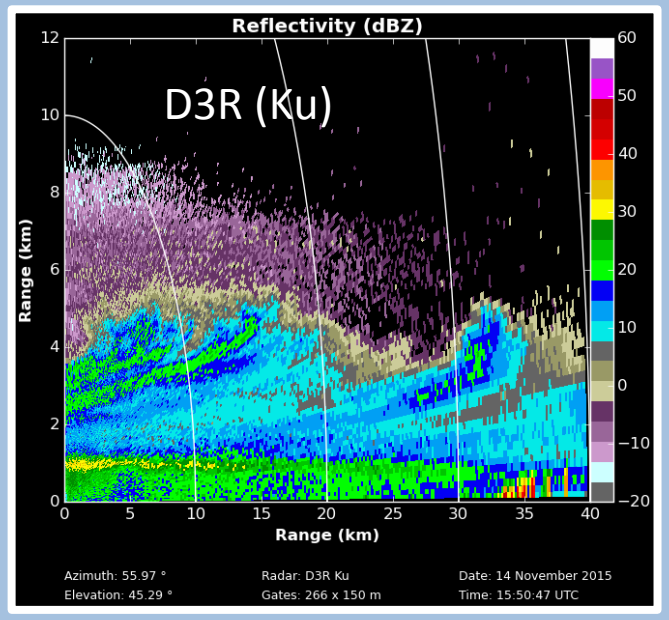




Looking forward

- Continue quality control of data
- Determining relative roles of warm-rain vs. ice-based processes (combinations)
  - Analysis of polarimetric variables relative to terrain and storm sector/type





Looking forward

- Continue quality control of data
- Determining relative roles of warm-rain vs. ice-based processes (combinations)
  - Analysis of polarimetric variables relative to terrain and storm sector/type
  - Use of aircraft data (transects, spirals)
  - Orographic enhancement
- Mechanisms (context of previous studies)
  - Brightband, shear, K-H instability

Thank you!

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