

1 Degree 1 Megawatt, Dual-Polarization, Dual-Frequency, DOW

Driving

Assembly: 2-3 Hours

Deployed and Operating

Key design specifications

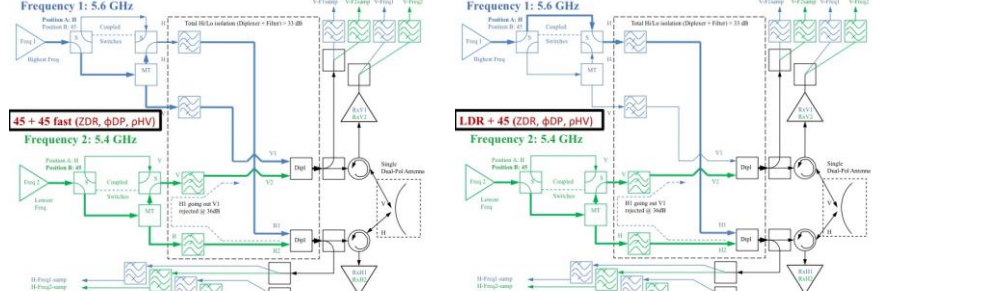


- C-band, 5 cm
- 1° beam
- dual-frequency = fast scanning and/or LDR + 45
- Operations in high wind (high torque motors, rugged)
- High power transmitter (dual 1 MW transmitters)
- Fast targetable deployment at highway speed
- Quick deployment 2-3 hour set up, no additional vehicles/cranes required
- Small site footprint; no site preparation
- Common hardware/software suite with DOW/SPOL LAOF radars
- Student Operable (2 technicians required for set up)

Field Project Deployment Modes

- Highly Mobile: highly mobile deployments requiring daily redeployment to new locations (e.g. PECAN, TILT, VORTEX2)
- Moderate Mobility: adaptable deployments requiring redeployment to different target regions every couple/few days (e.g. RELAMPAGO, LOBSTAS, VORTEX-SE, OWLES)
- Stationary: Stationary deployments where the CROW is deployed only a few times during an entire project (e.g. MITMEX, GRAINEX, SNOWIE, hurricane projects, island/marine projects).

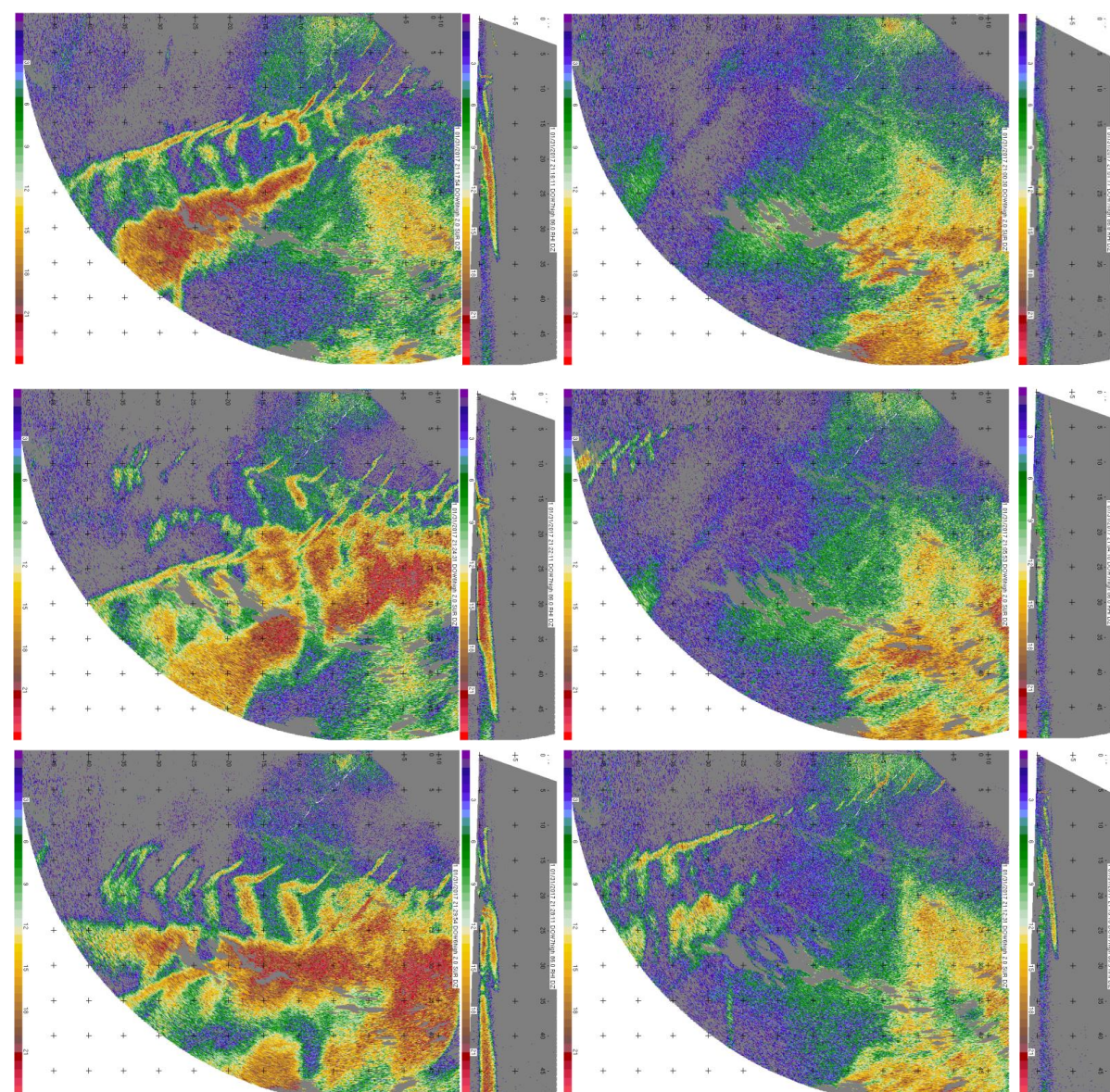
Dual Fast 45 polarization using two freqs OR LDR (freq 1) plus 45 (freq 2)



SNOWIE January-March 2017

2 DOW deployment in Idaho

DOW Observations of Precipitation caused by cloud seeding



2017 Hurricane Missions: Harvey

Intense wave number 4-5 mesovortices
Delta-Vs up to 40 m/s
Sub-meso waves with different structure than streaks

Mesos absent in Irma
First RHs from inside eye of intense hurricane

Peak DOW Anemometer Winds

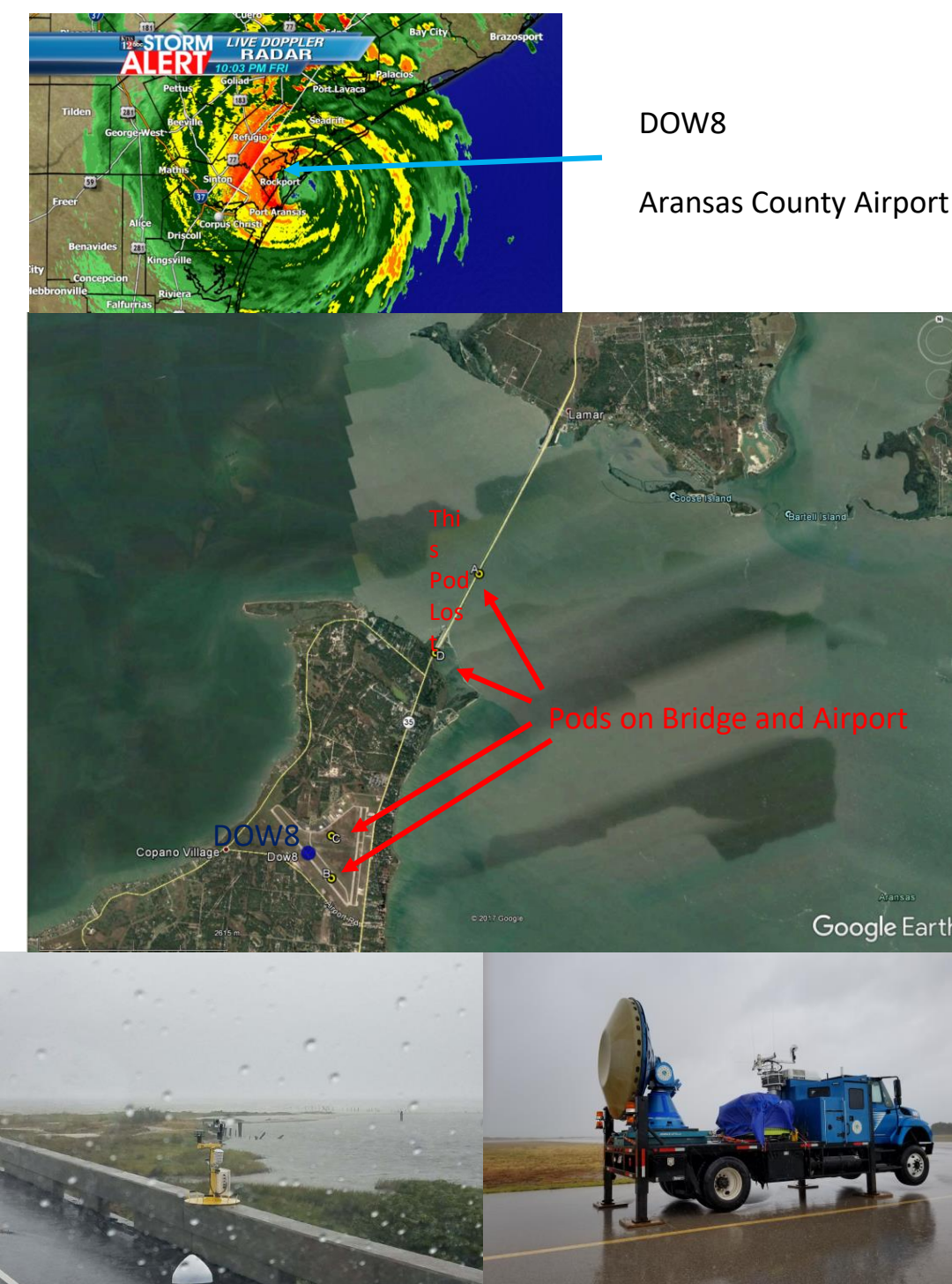
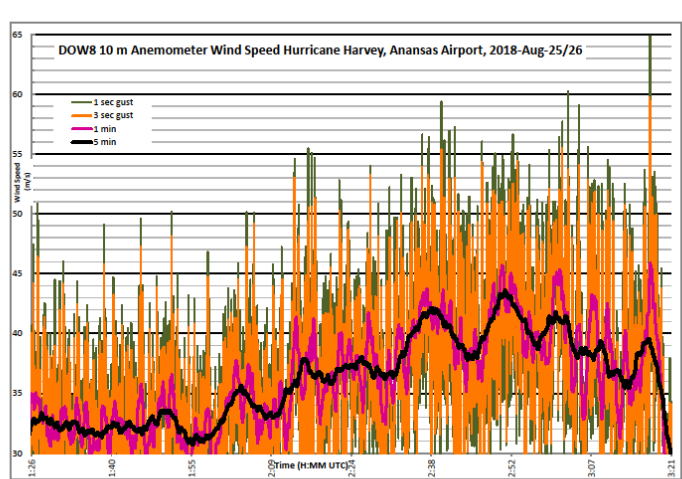
RM Young @ 8 meters AGL

1-second gust: 64.9 m/s 145 mph 3:17 UTC

3-second averaged gust: 59.8 m/s 134 mph

1-minute average: 45.9 m/s 103 mph

5-minute average: 43.6 m/s 98 mph

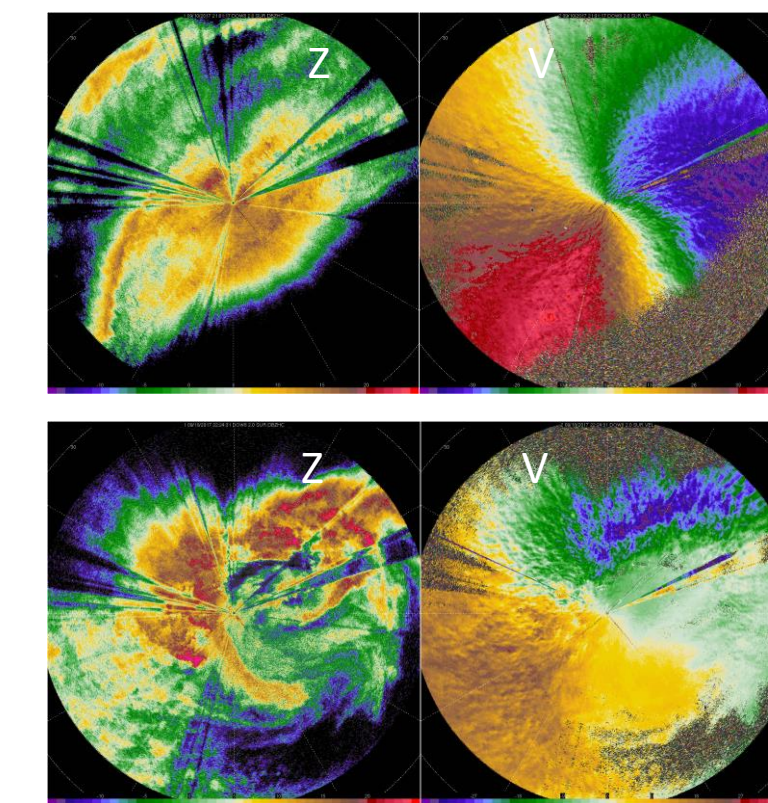


DOW Facility and analysis supported by NSF grants 1361237, 1211132, 1259185, 1442054, 1447268, 1759461

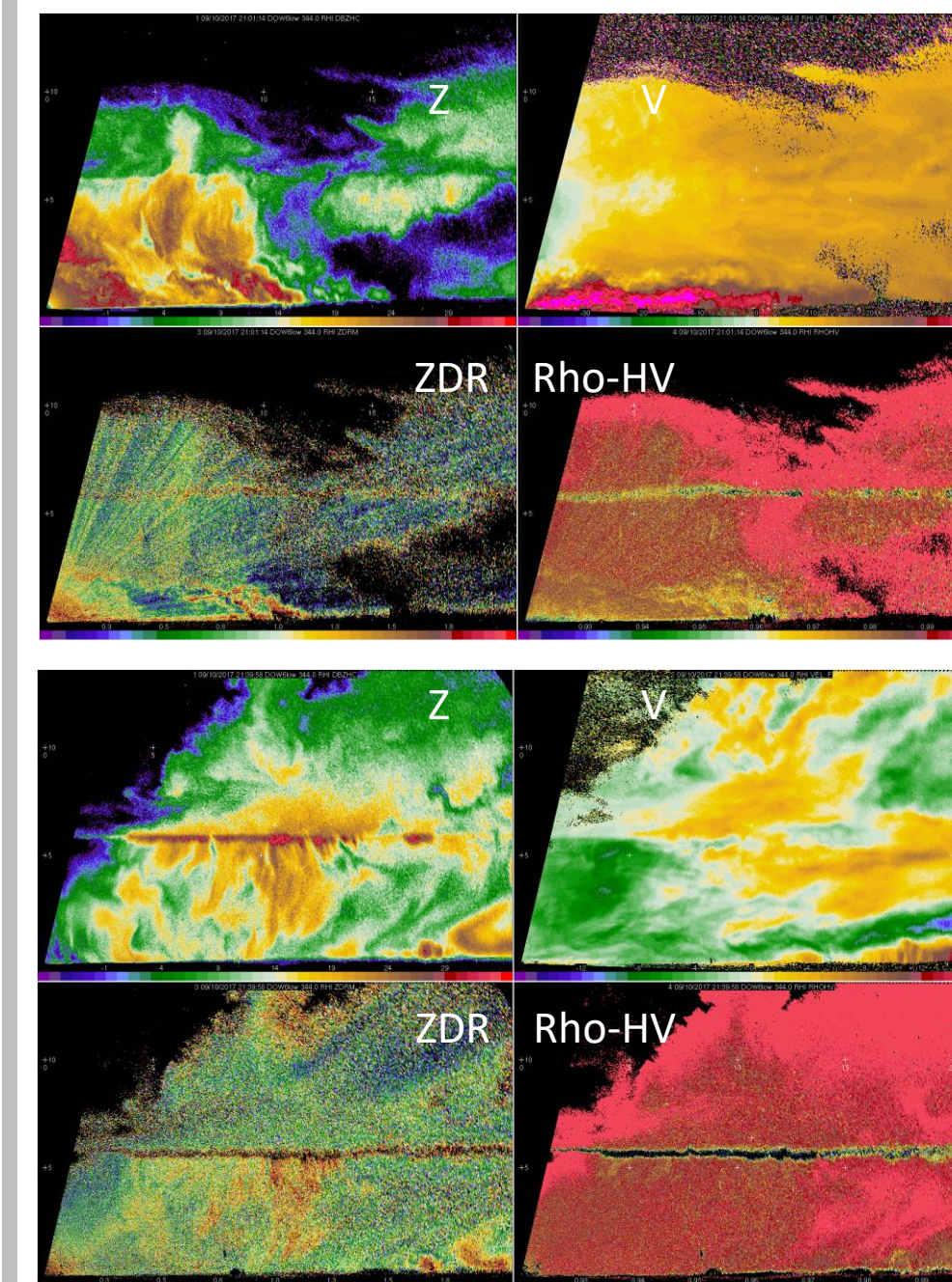
2017 Hurricane Missions: Irma

Deployed 2 DOWs
4 Pods
1 Mobile Mesonet

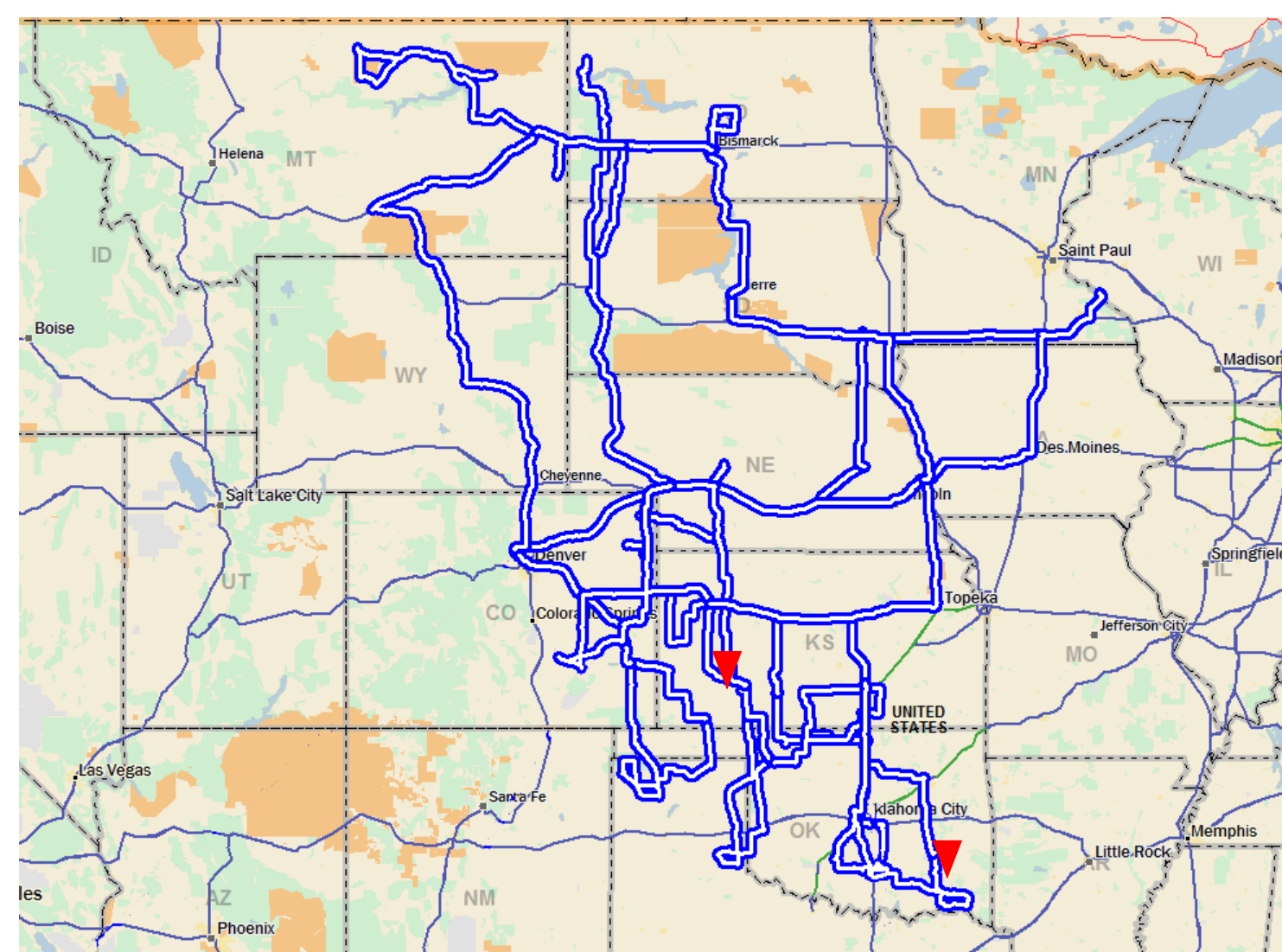
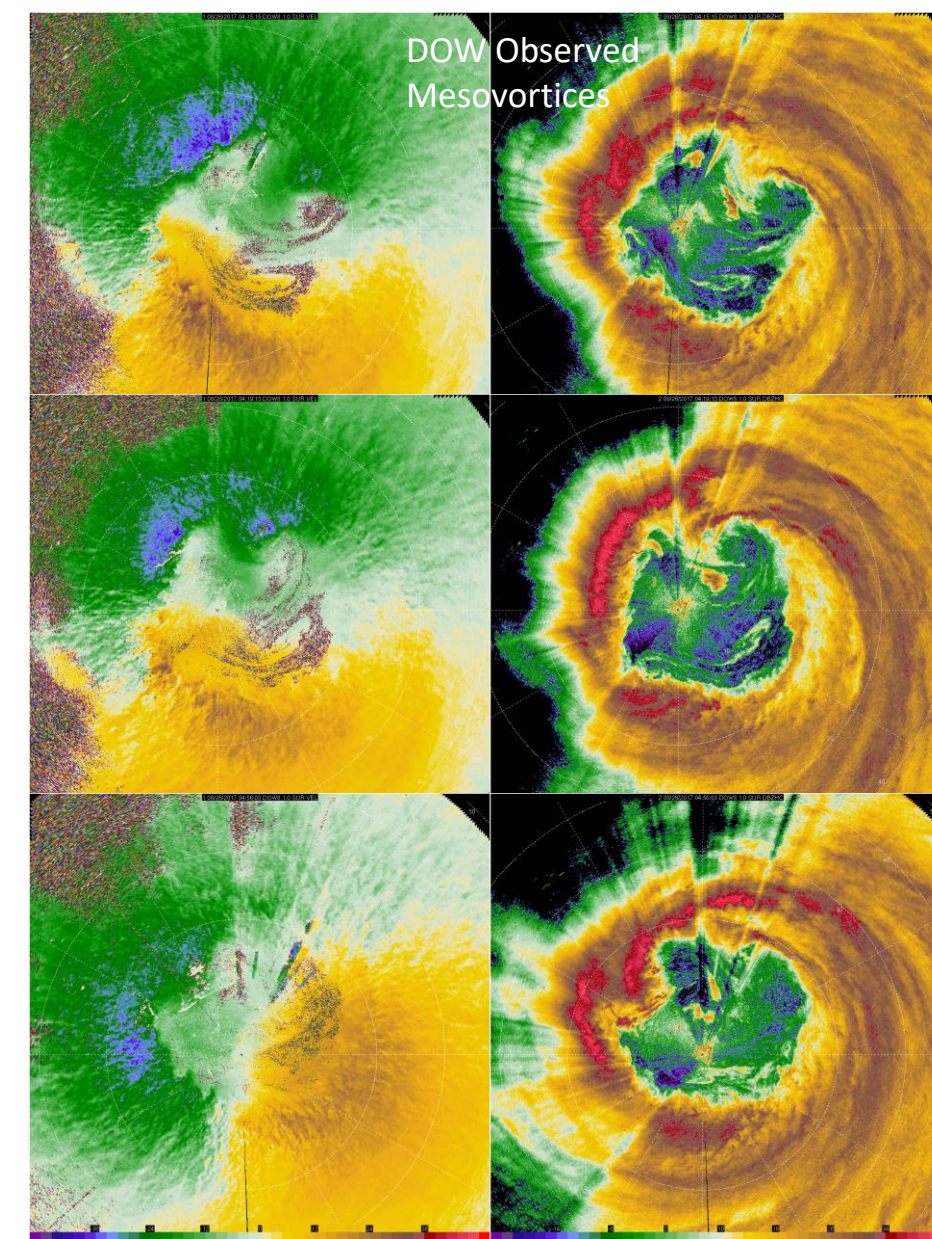
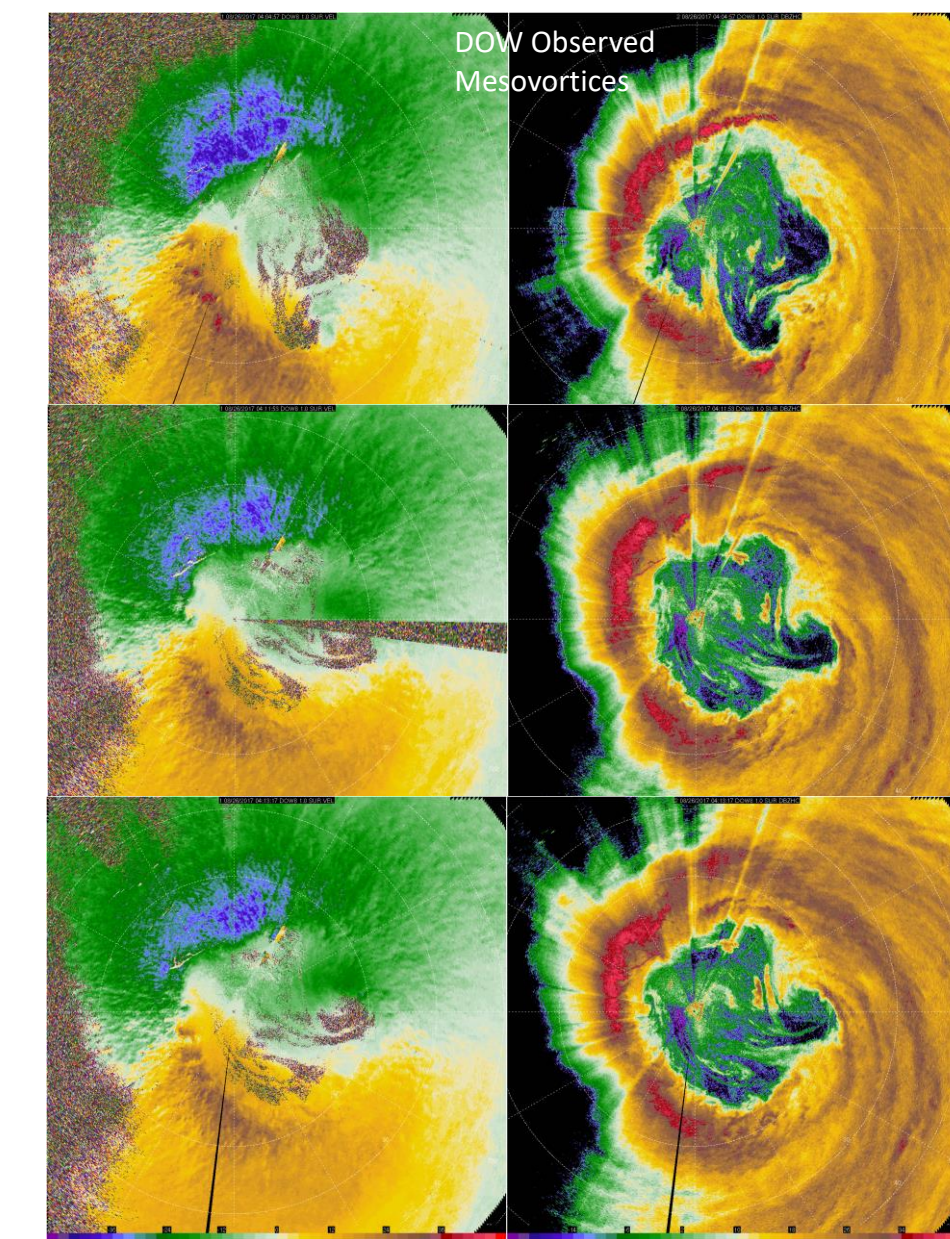
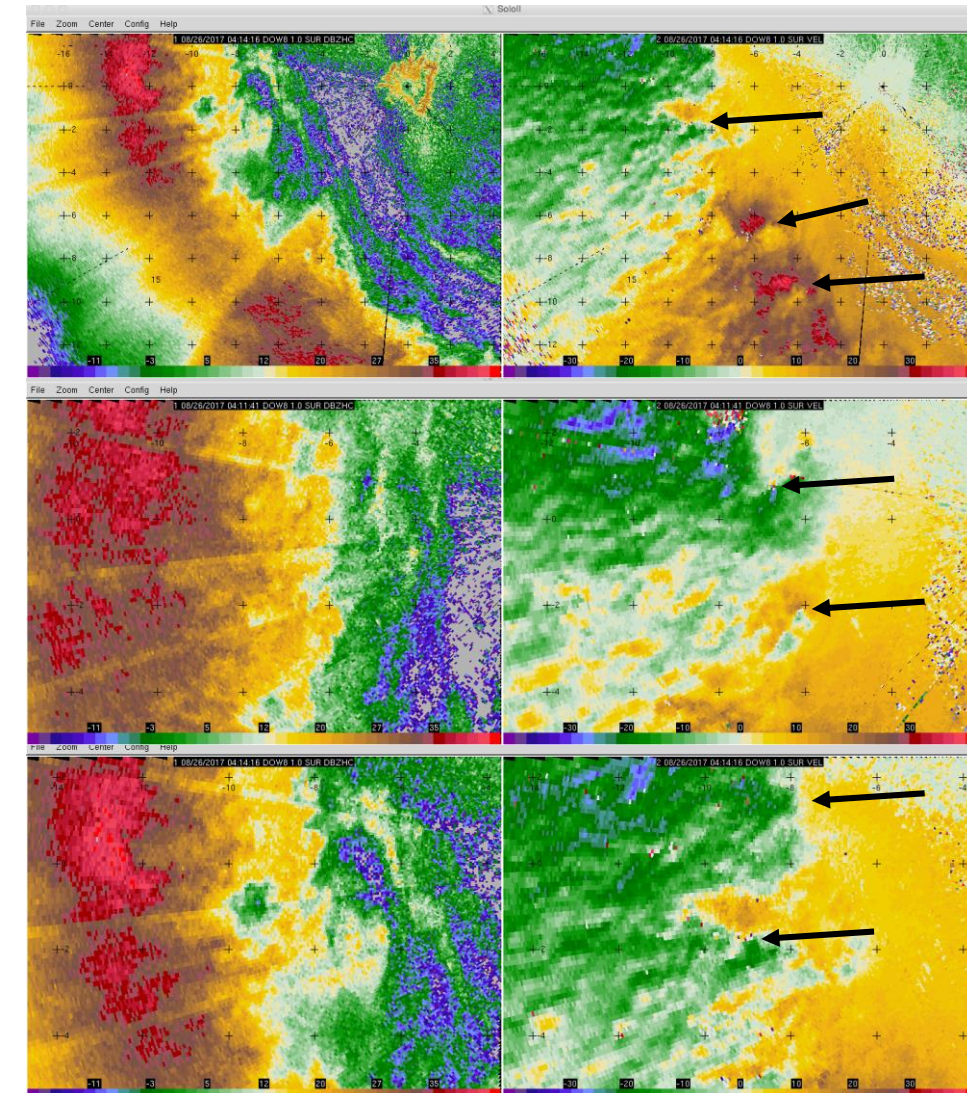
Messy eye structure



First high-resolution Dual-polarization RHs in eye of major hurricane



Sub-km scale, smaller than mesovortices rotations within eyewall
Delta-V less than tornadoes.
Increases in already strong eyewall winds of 20 m/s.



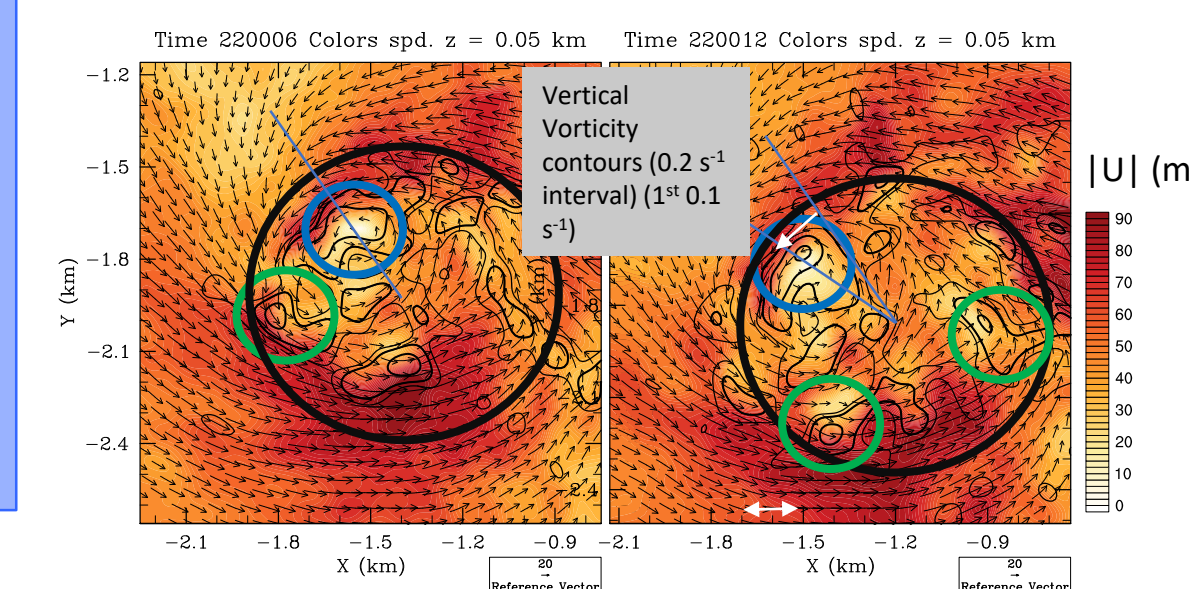
Season: 1 May – 15 June 2016
Miles: 16,000+
Participants: 20+
3 DOWs
2 DP/DF (12.5 m gates)
1 RS (11 m gates)
3 Mesonets
14 Pods

TWIRL 2016: Overview
THE YEAR OF MT AND MN!

Tracking individual sub-tornado-scale vortices revolving about tornado center

190 m / 6 s ~ 30 m/s
Tangential flow ~ 50 m/s
So, this wavenumber ~3 Rossby Wave propagating upstream at ~20 m/s

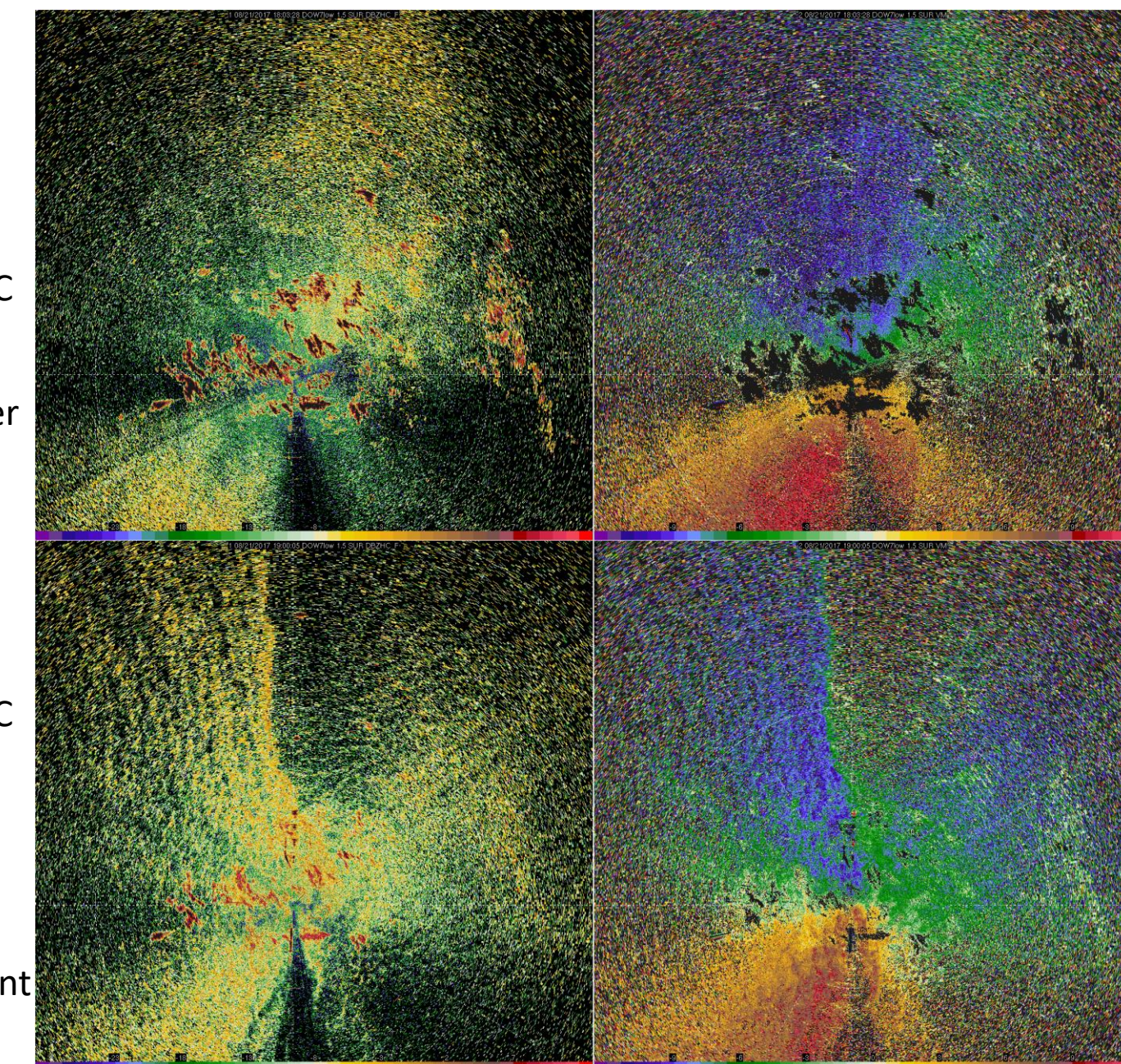
But, sub-vortex structure is complex and evolving quickly



2017 Eclipse dual-Doppler, Pods, Soundings

Characterizing Boundary Layer Changes and disappearance of BL rolls
Temperature and Wind Drops,
Propagating Boundary with Wind Shift

Shortly After
Totality:
1803 UTC



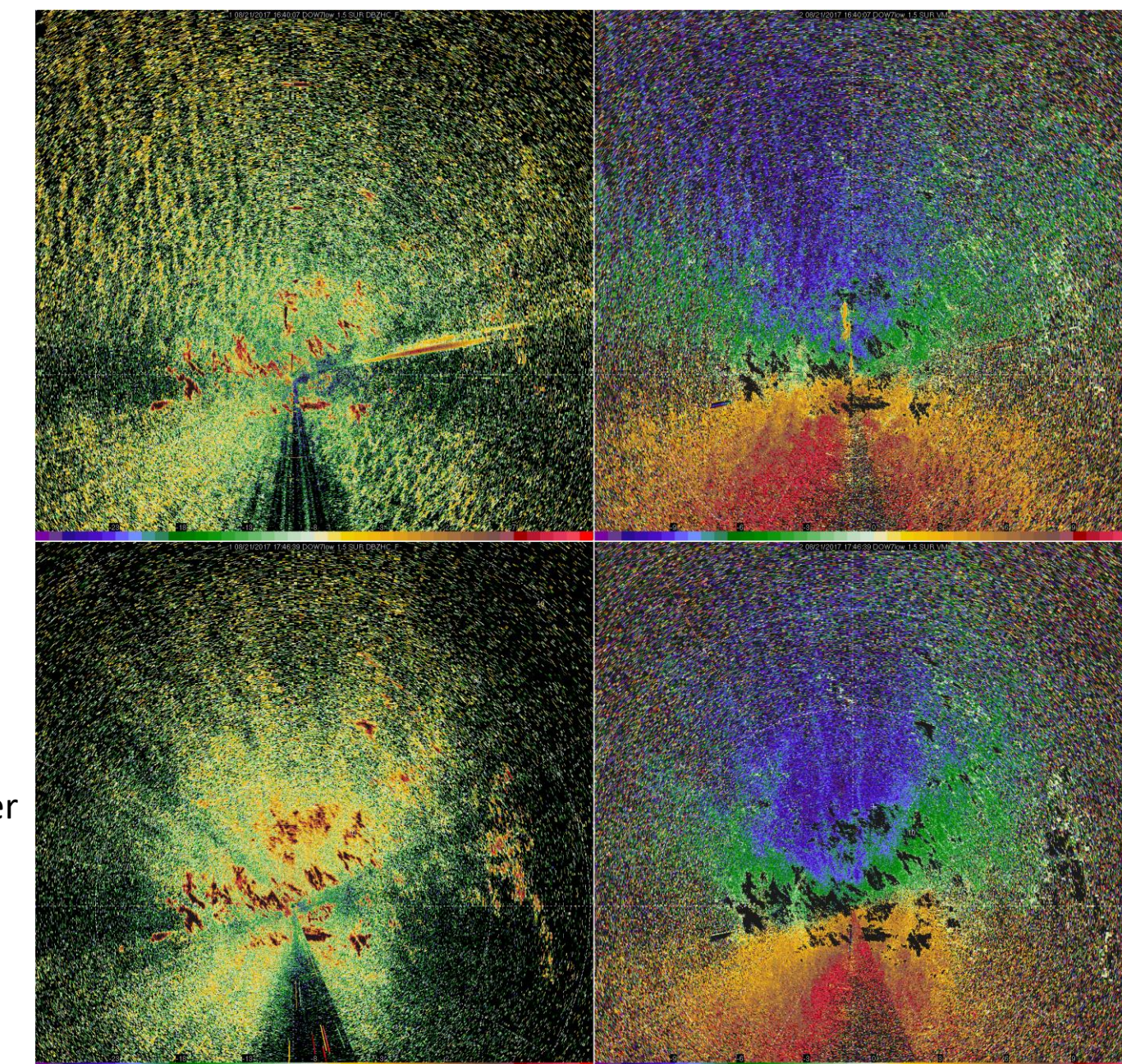
Boundary Layer
Rolls
Still Gone

After:
1900 UTC

Boundary Layer
Structure and
Rolls Recover

Boundary Present

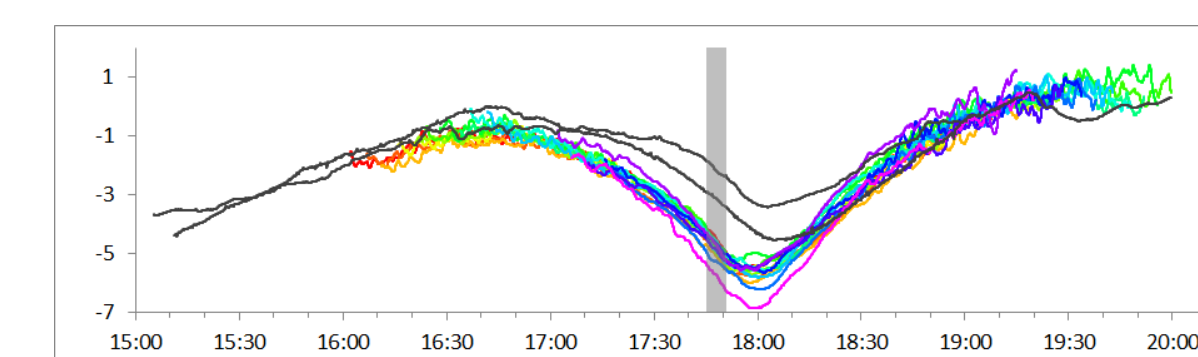
Before:
1640 UTC



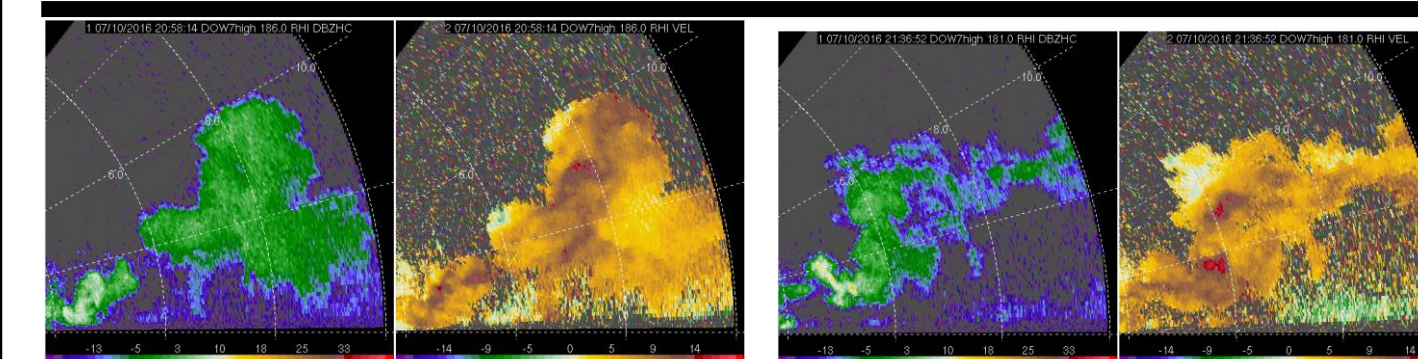
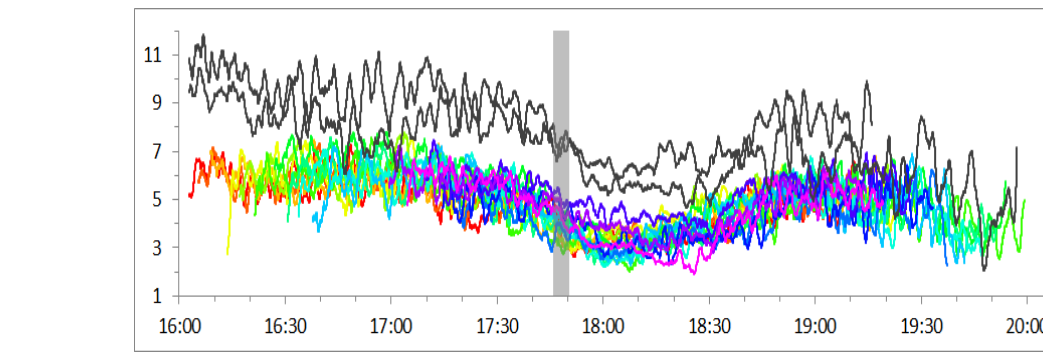
Totality:
1747 UTC

Boundary Layer
Rolls
Disappear

Temperature Drop During Eclipse



Wind Speed Drop During Eclipse



Wildfires: DOWs have intercepted 3 wildfires, mapping winds, hot spots, plume-top divergence, plume evolution, and other plume features. This images from the Nederland fire of 2016