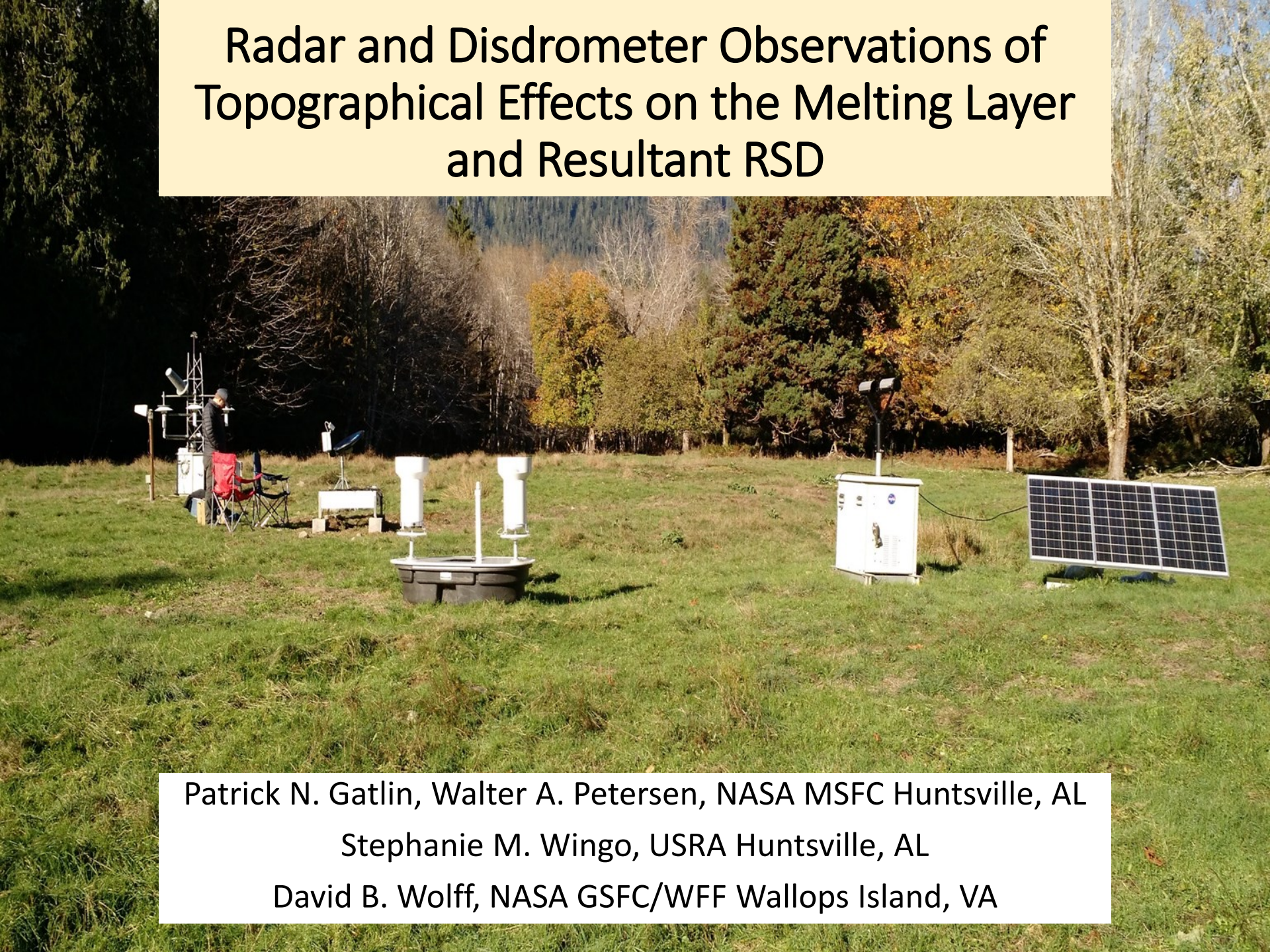
Radar and Disdrometer Observations of Topographical Effects on the Melting Layer and Resultant RSD

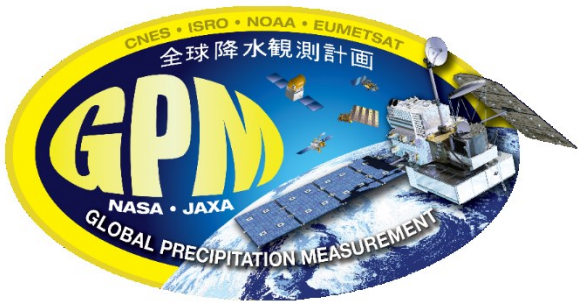


Patrick N. Gatlin, Walter A. Petersen, NASA MSFC Huntsville, AL

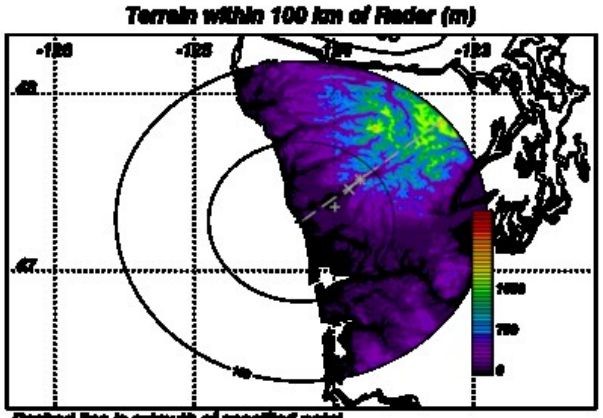
Stephanie M. Wingo, USRA Huntsville, AL

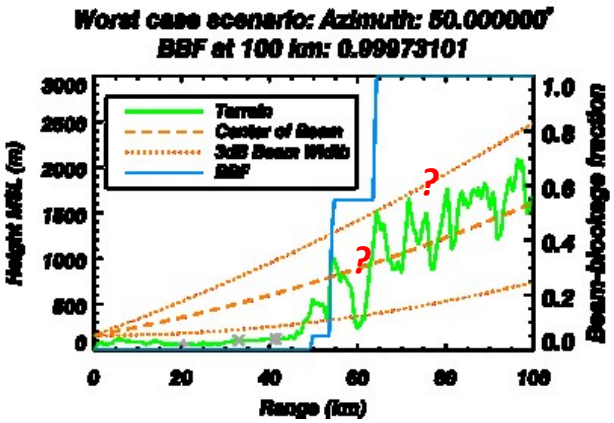
David B. Wolff, NASA GSFC/WFF Wallops Island, VA

Radar retrievals are complicated by topography



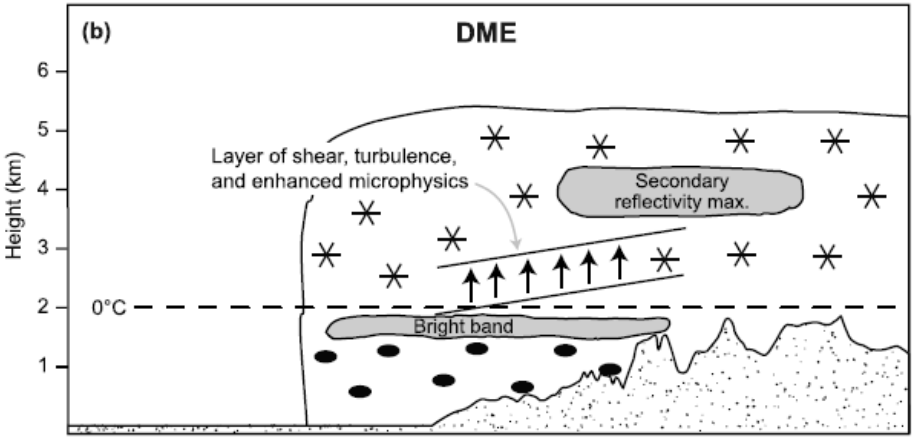
Satellite-based radar "cluttered" near ground



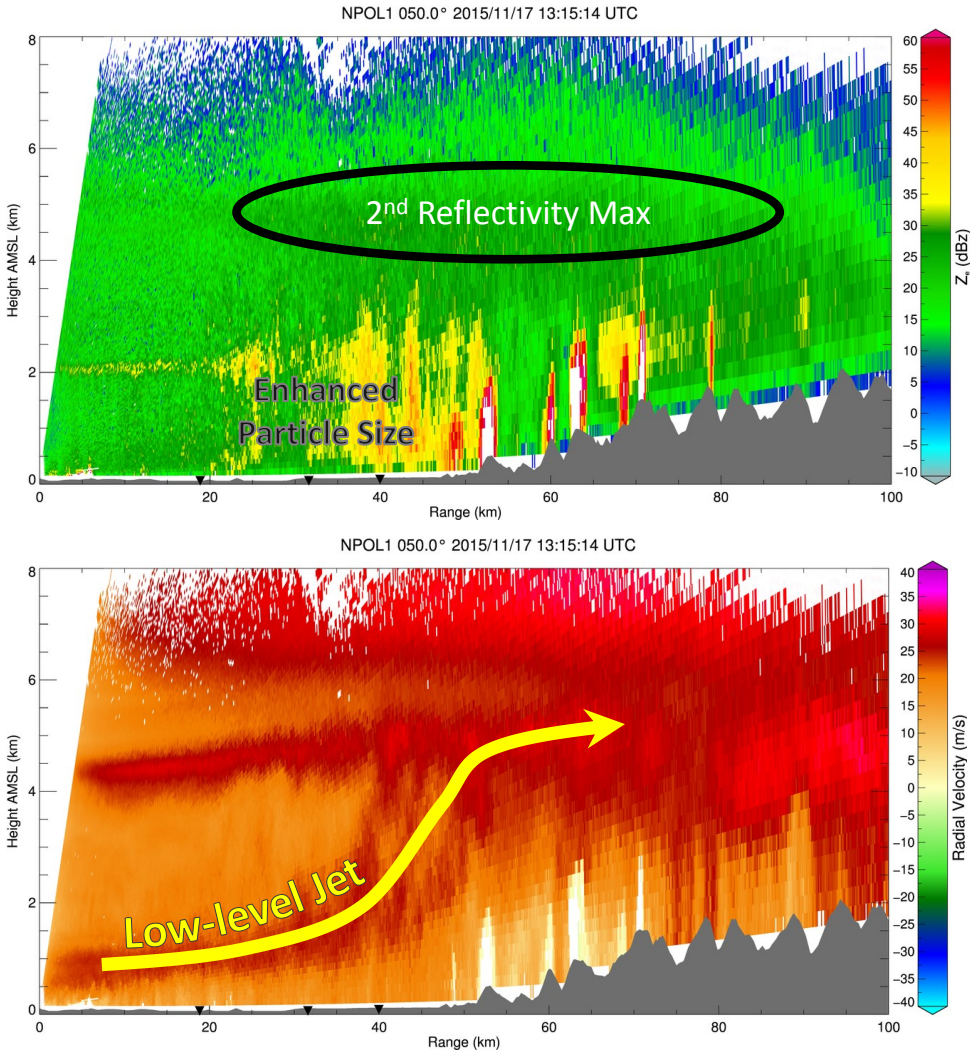


Ground-based radar blocked by mountains

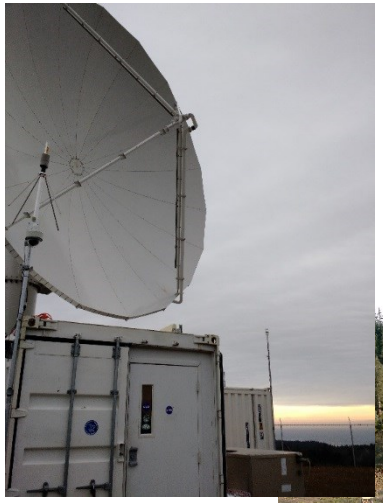
Topography enhances precipitation growth



From Medina et al. (2007)

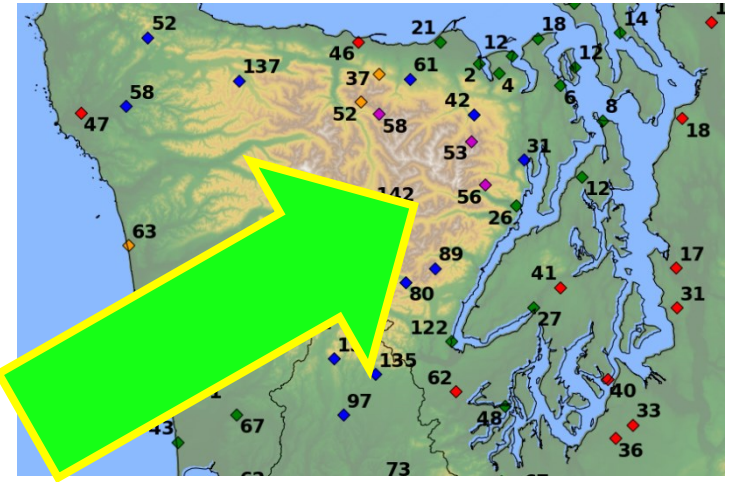


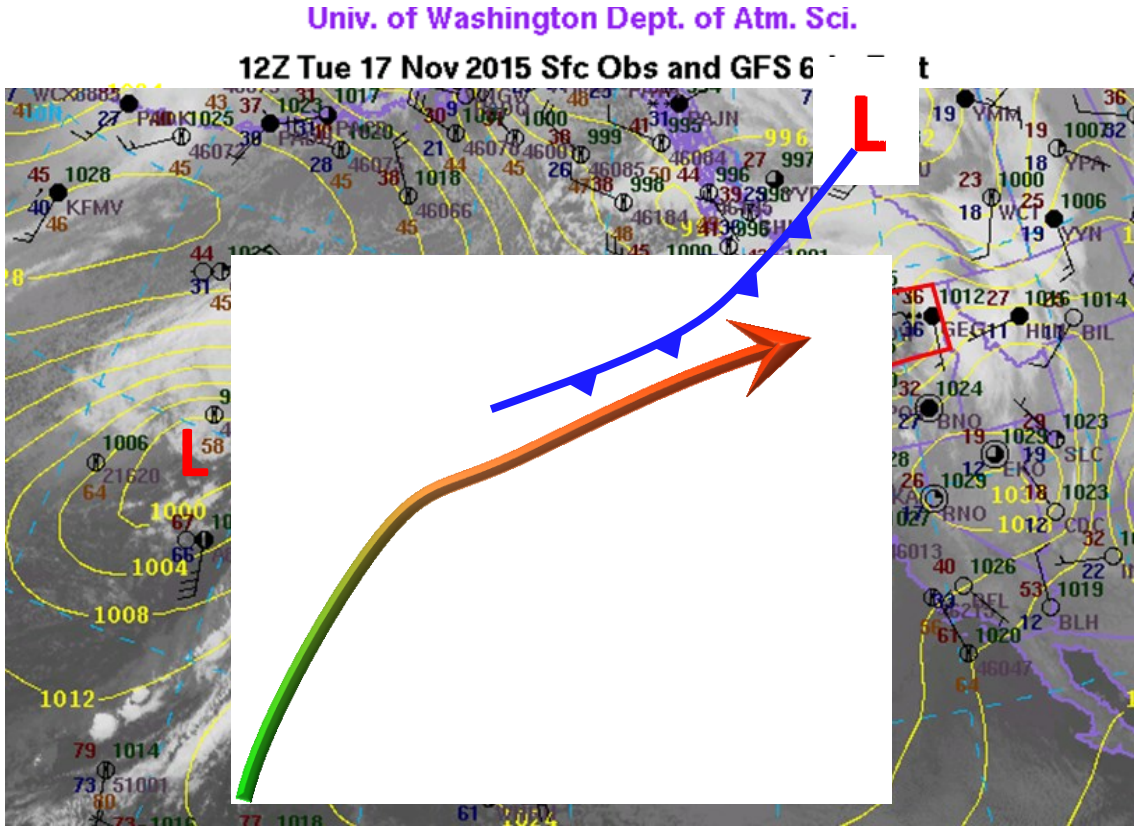
Different perspectives can elucidate what's hidden



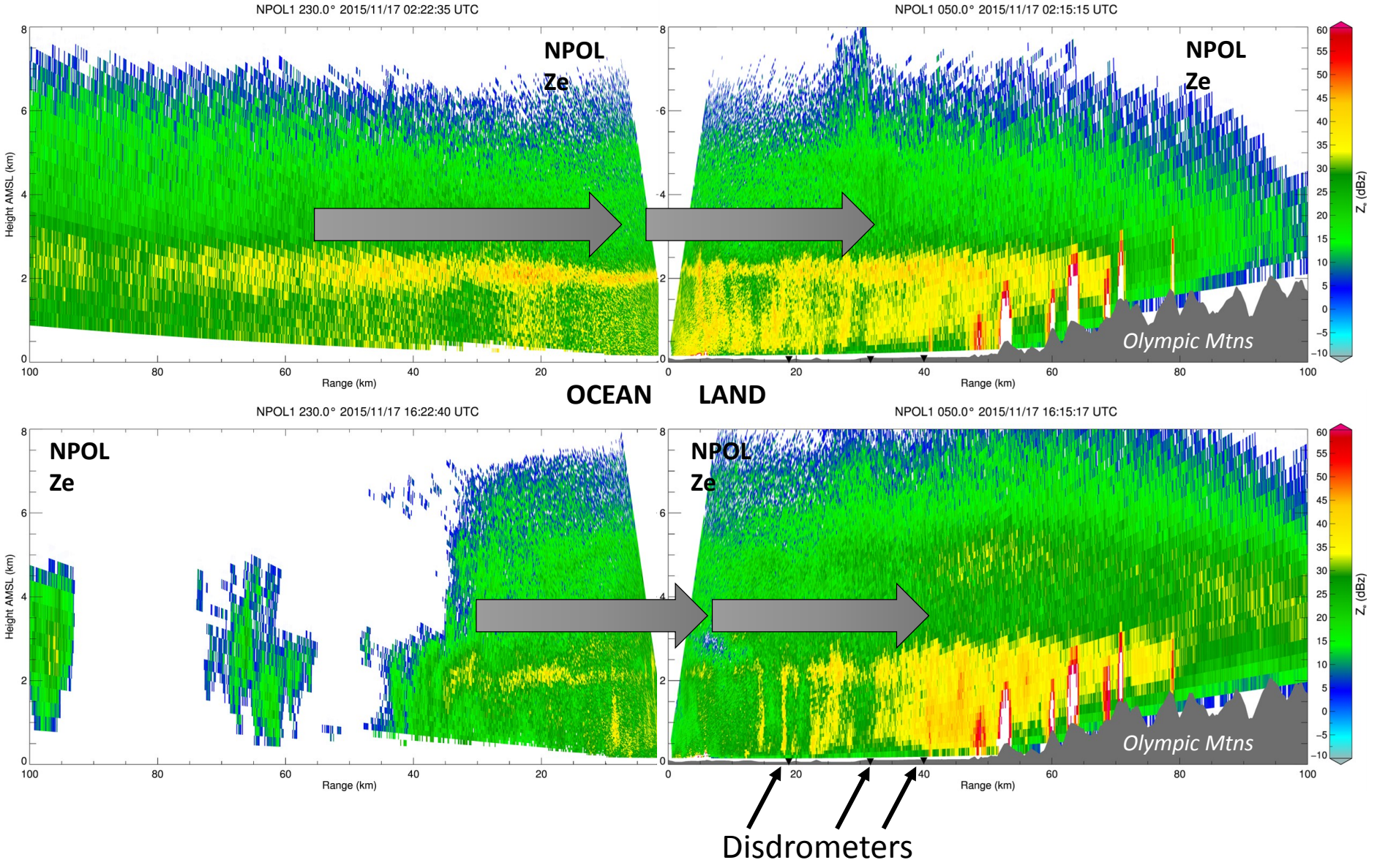
OLYMPEx Nov 17, 2015 case

- Onshore flow across Olympic Peninsula
- Rainfall Totals in QRV:
  - Coast: 40-60 mm
  - 20 km inland: 100 mm
  - 35 km inland: 140 mm
  - 45 km inland: >220 mm

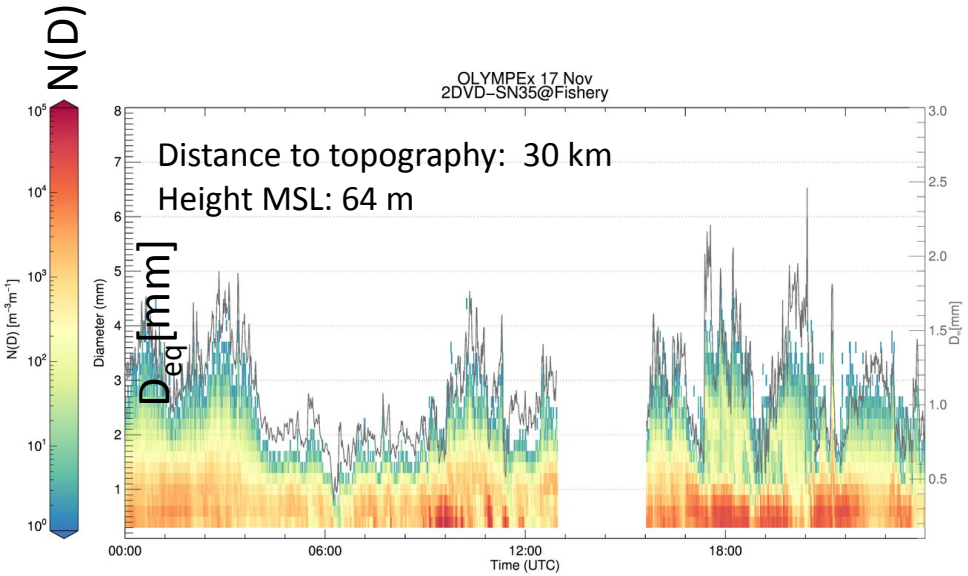


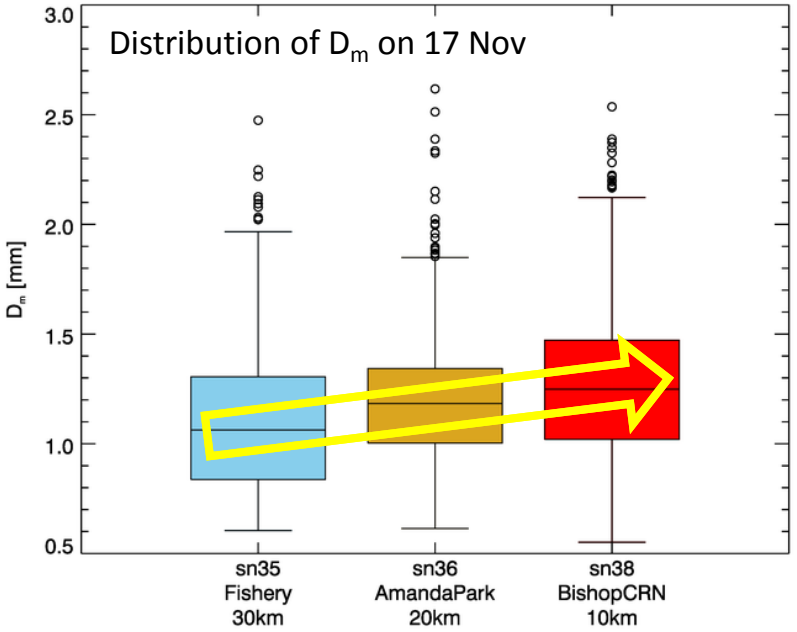


Precipitation enhanced as it moves inland and interacts with mountains

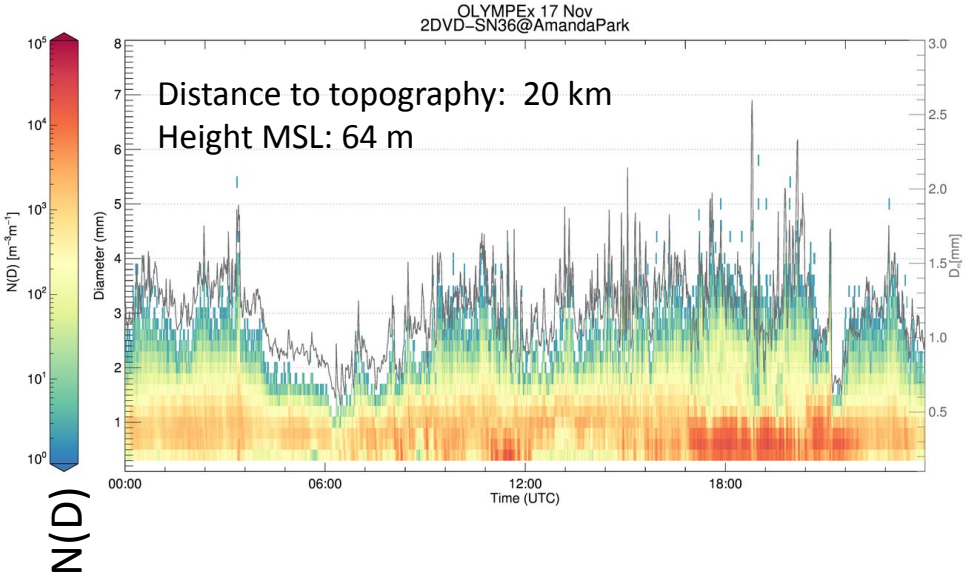


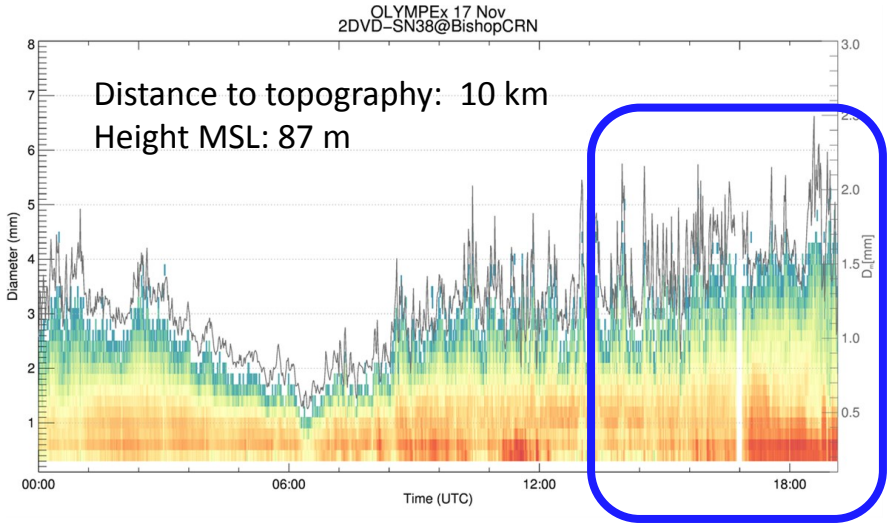
DSD time-series from 2DVDs

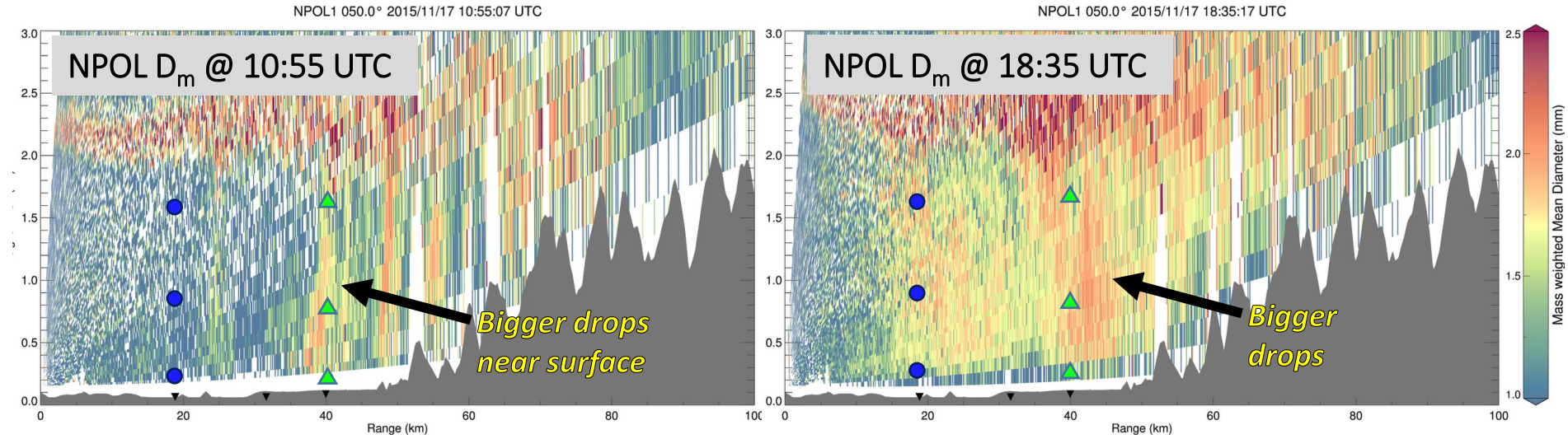


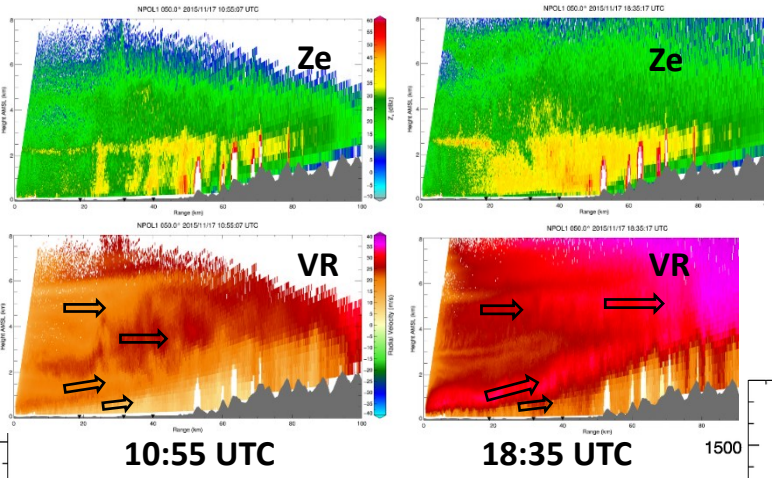


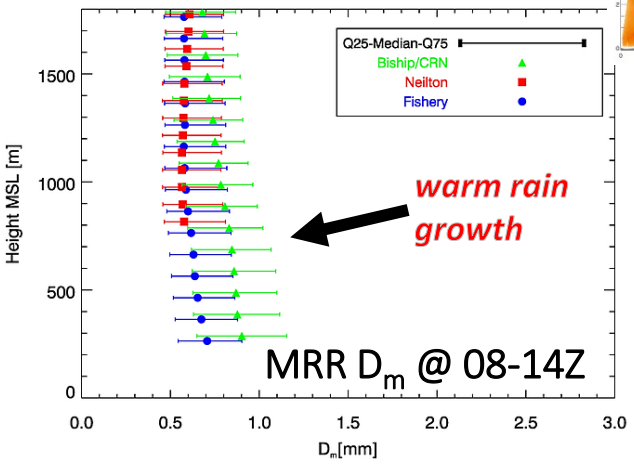
Raindrop sizes observed at the ground increase closer to the mountains



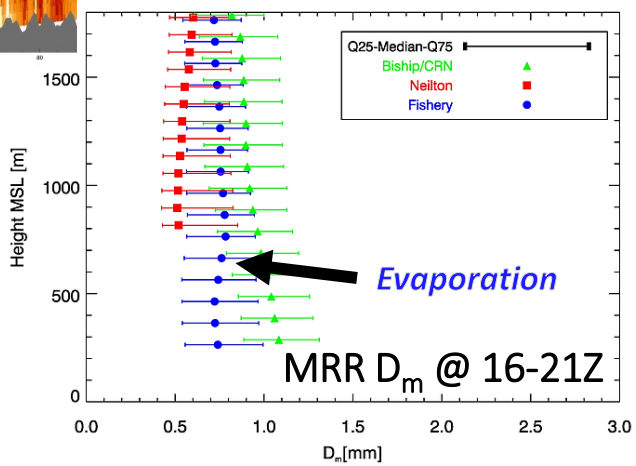




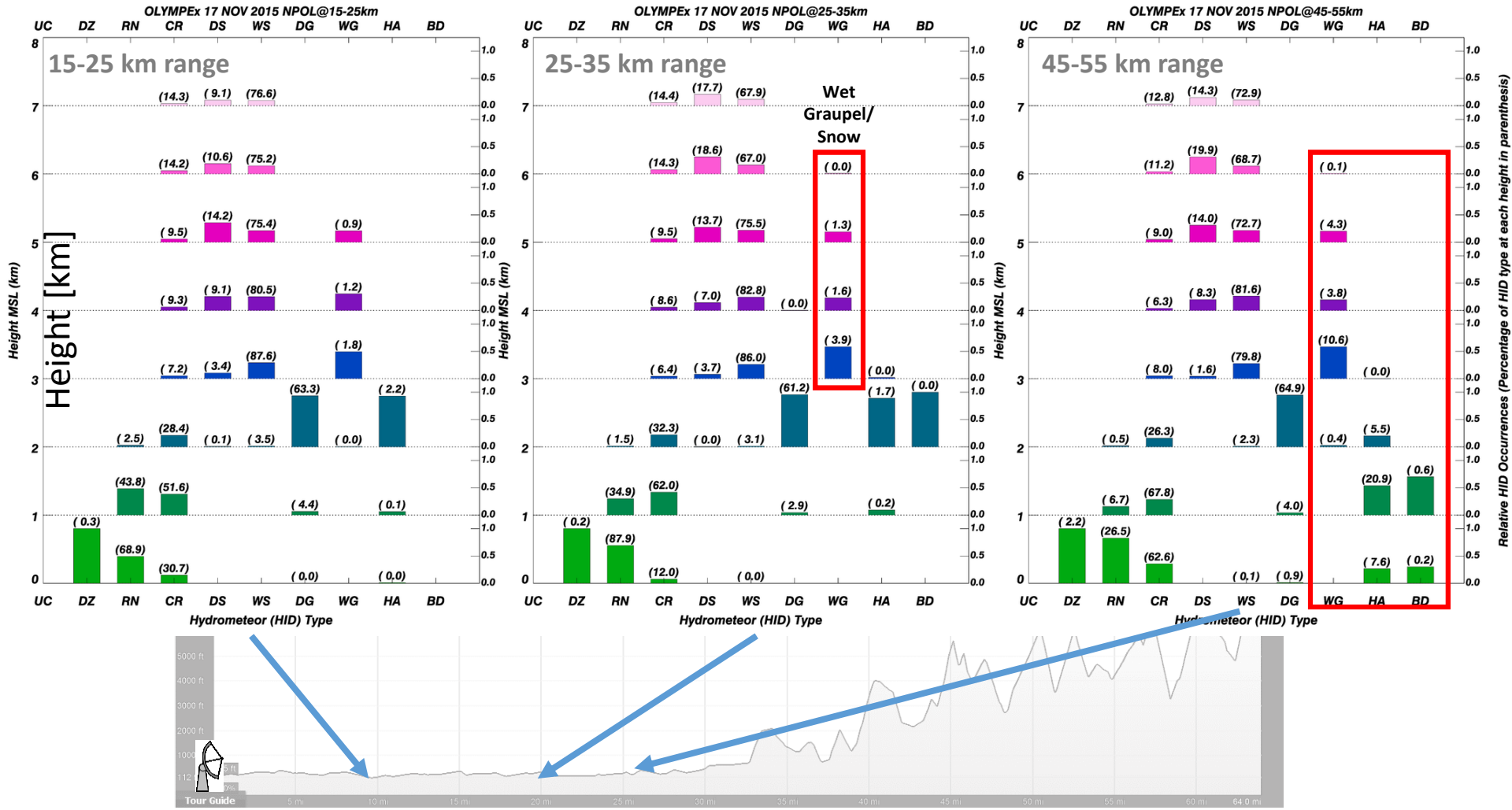




D$_m$ increase toward the ground, especially at site closer to mountains

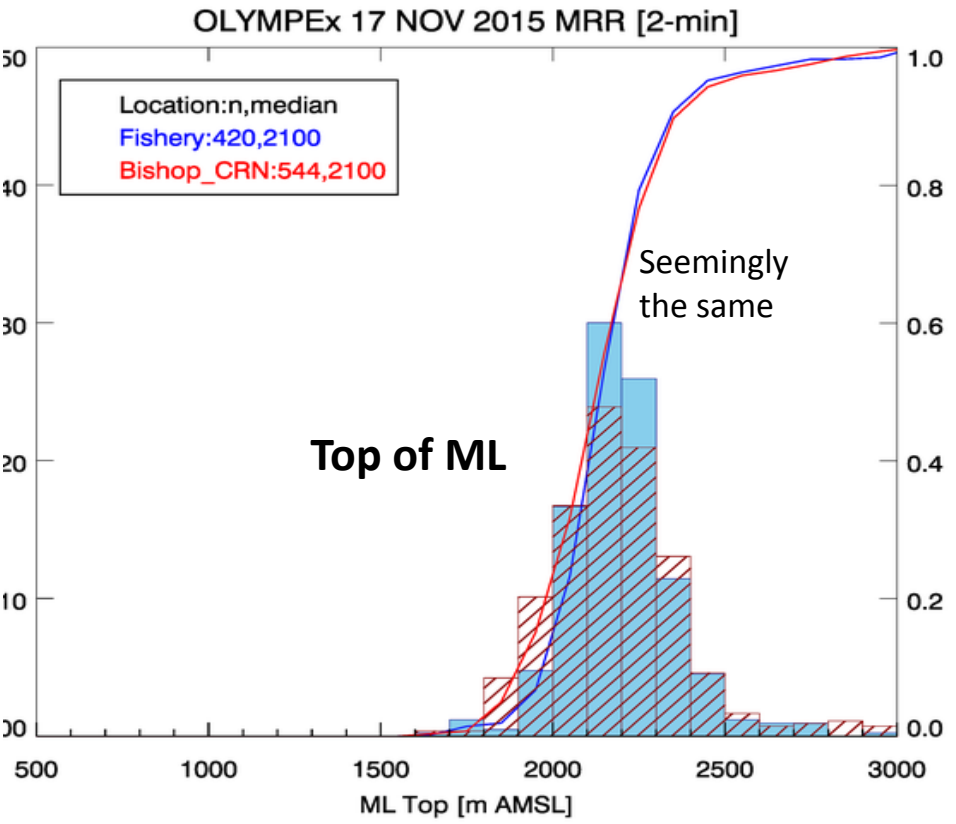


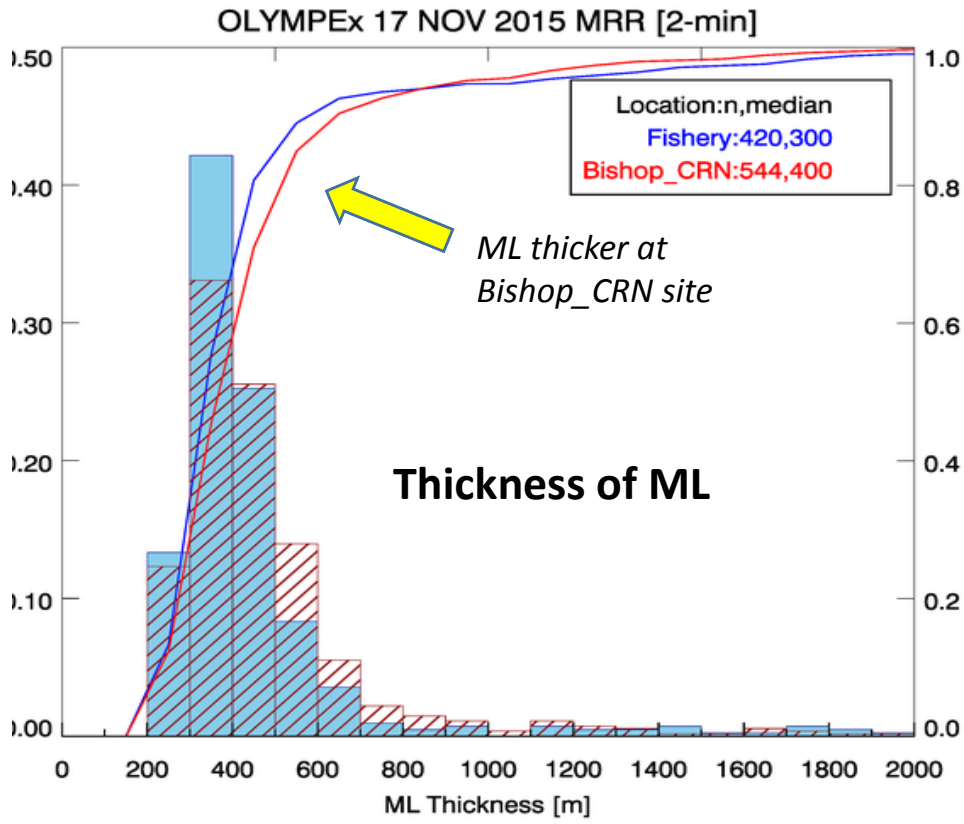
NPOL HID Distribution



Relatively more riming and big drops closer to mountains

Melting Layer from MRR vertical velocity



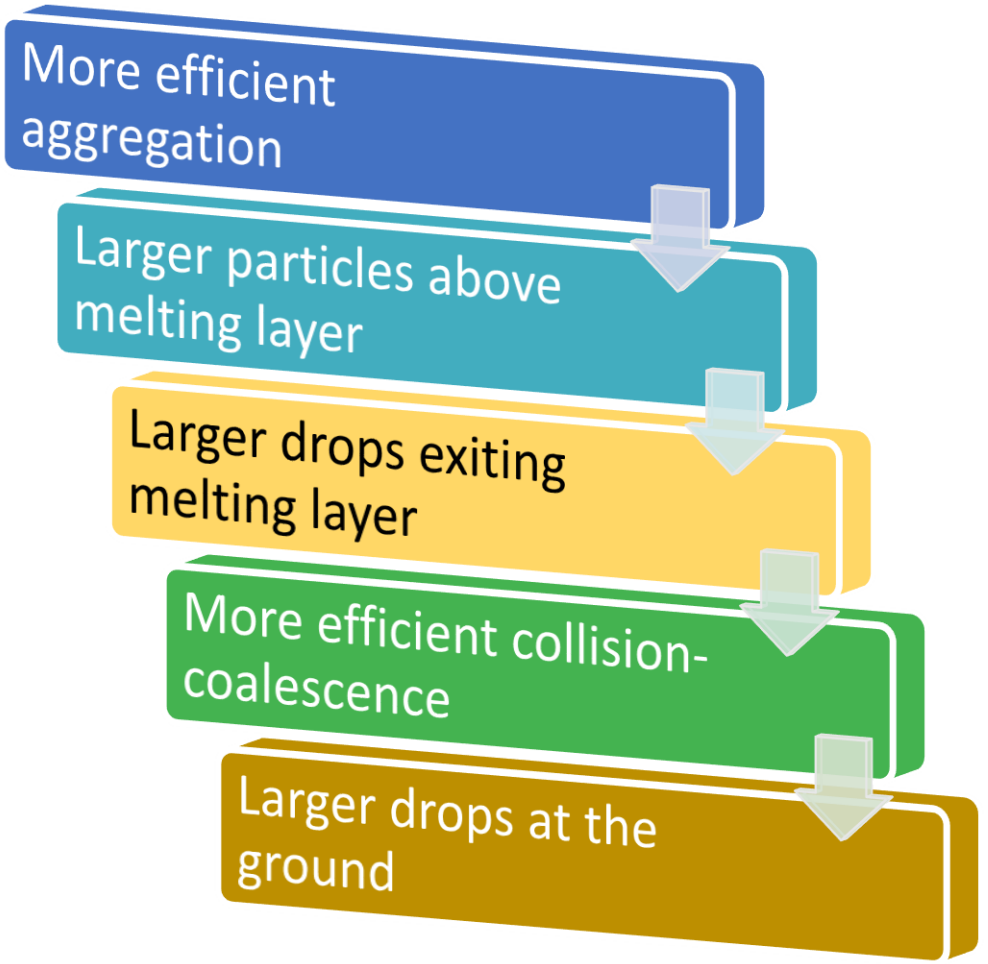


Location	Elevation [m]	Distance from Mtns [km]
Fishery	64	30
Bishop_CRN	87	10

→ *ML thickens closer to the mountains*

How does topography affect the DSDs?

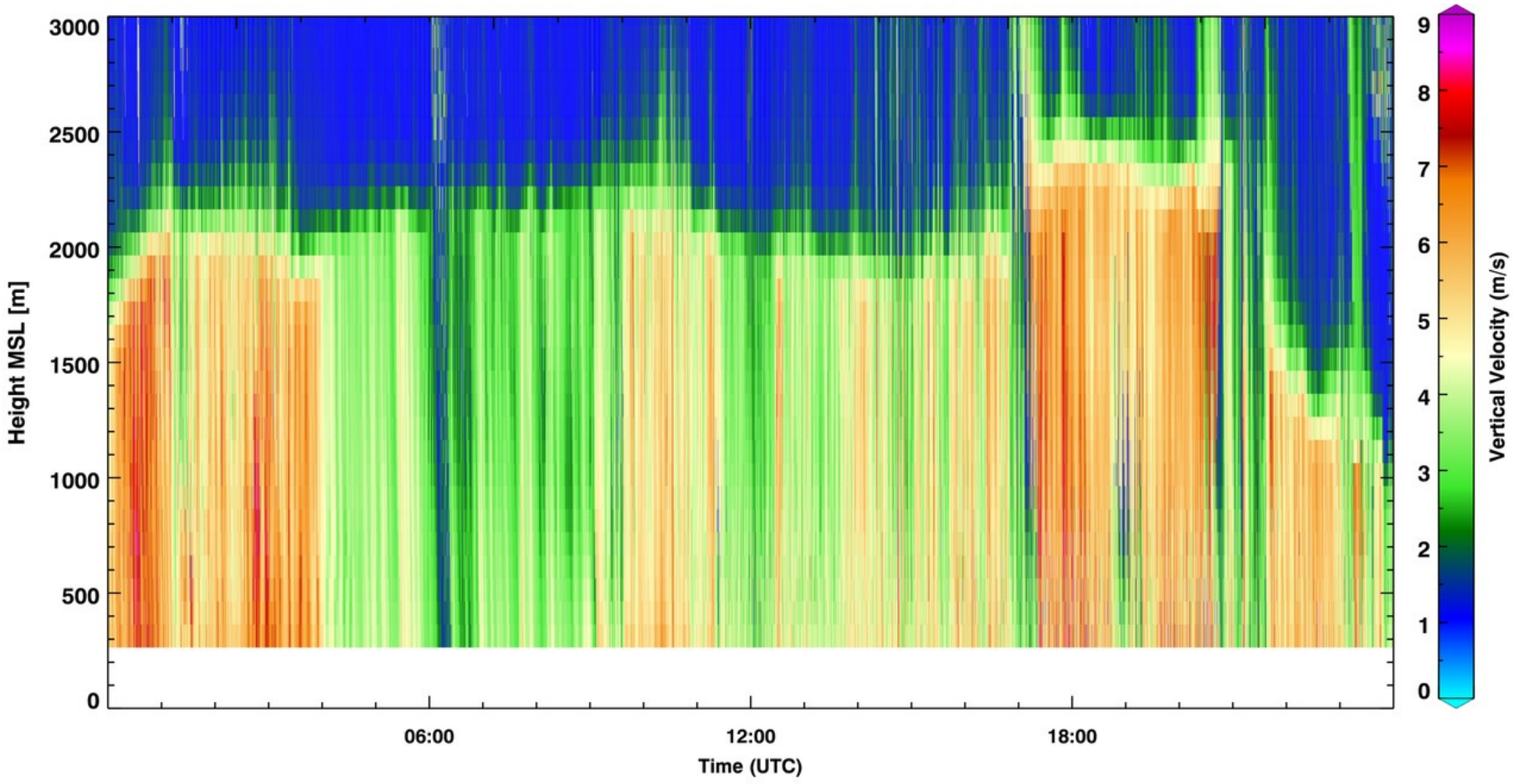
- DSDs are altered by topography
- Riming is seemingly enhanced by topography
- Melting layer vertical extent of enhanced by topography
- Collision-coalescence efficiency ultimately enhanced by topography



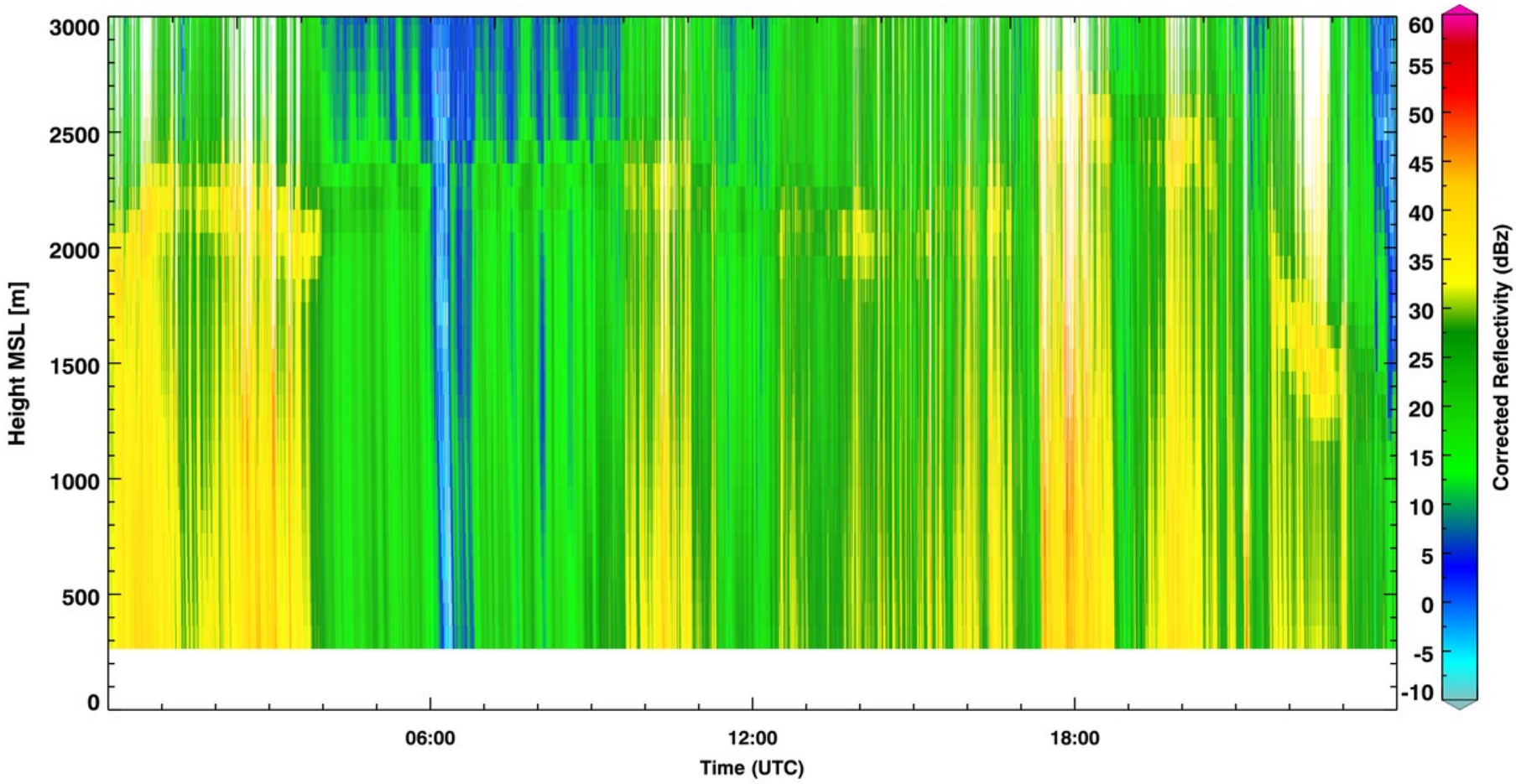
Caveat: Orientation of flow relative to topography can govern this

Backup Slides

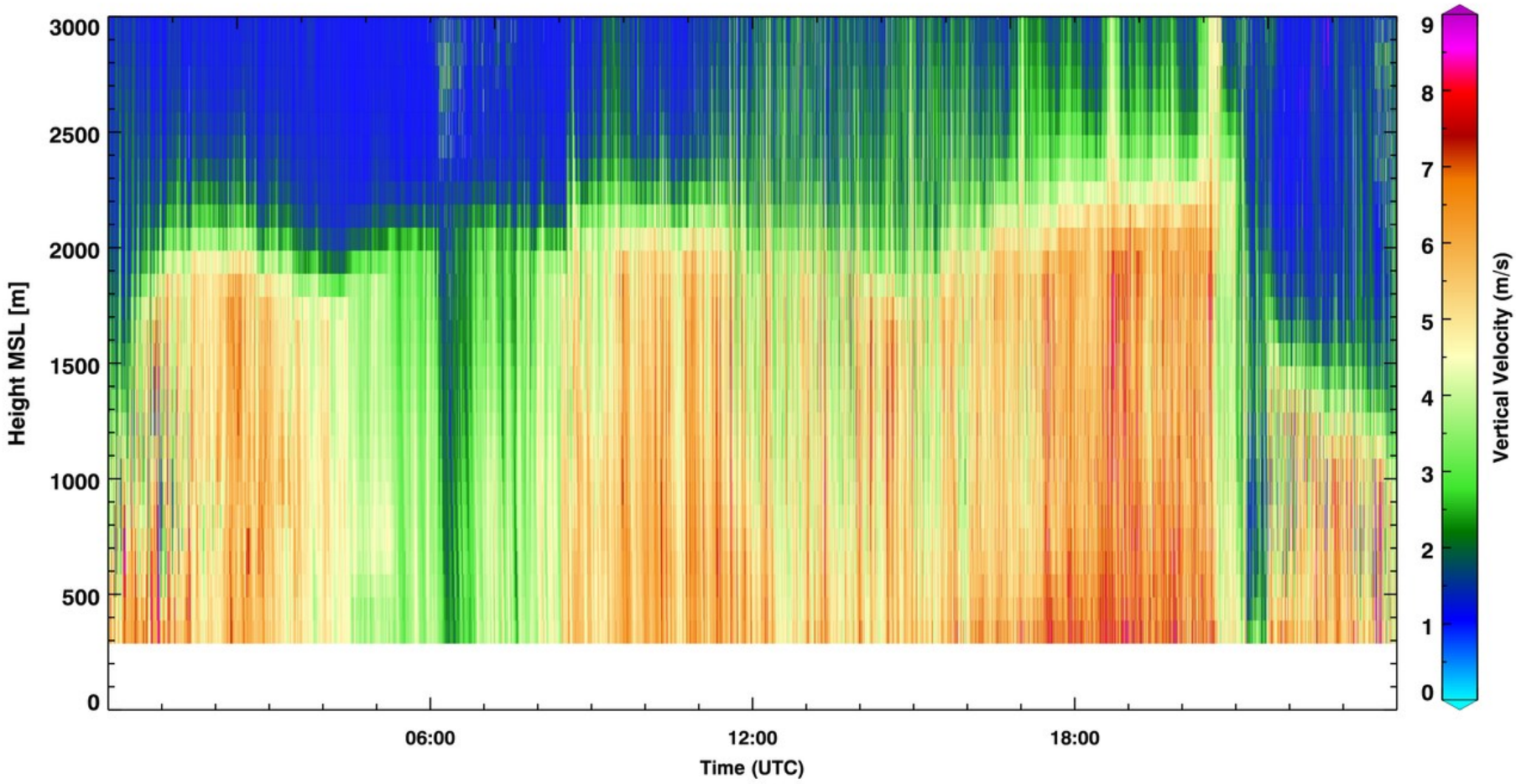
OLYMEx 17 Nov 2015
MRR Fishery



OLYMEx 17 Nov 2015
MRR Fishery



OLYMEx 17 Nov 2015
MRR Bishop_CRN



OLYMEx 17 Nov 2015
MRR Bishop_CRN