



The Olympic Mountains Experiment (OLYMPEX): Overview and Status

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Goals

- Physical validation to support GPM algorithms for measuring precipitation from space



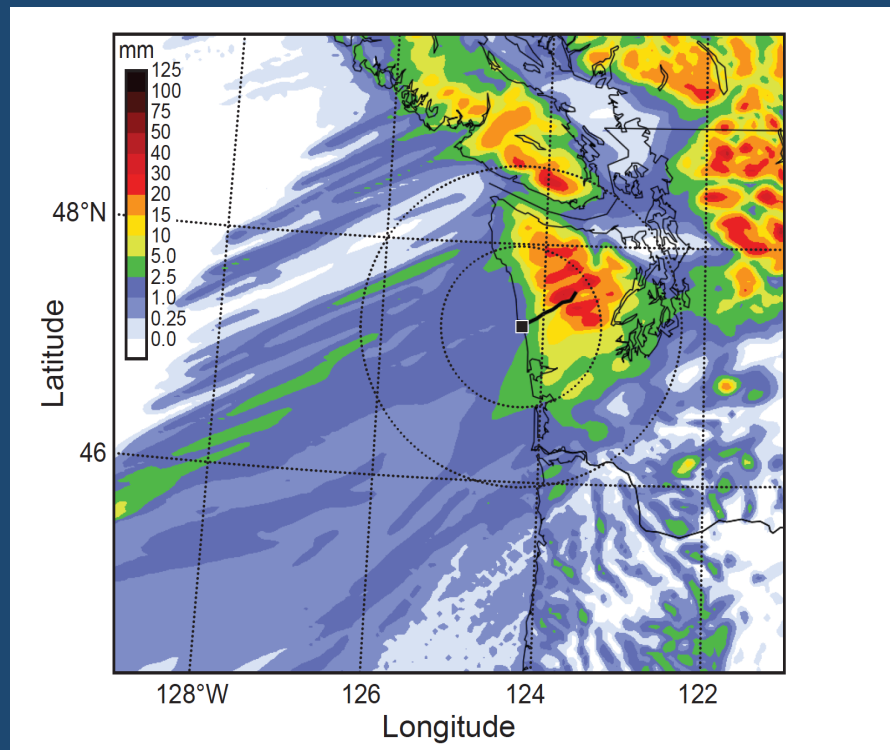
The GPM satellite – measuring precipitation from space with an active Radar and passive microwave imager



Launched 28 Feb 2014
from Tanegashima Space
Flight Center in Japan

Goals

- Physical validation to support GPM algorithms
- Orographic effects on frontal precipitation



Regions of the Olympic Peninsula



OLYMPEX: Precipitation Processes in wintertime Midlatitude Cyclones over complex terrain

Aircraft

- DC-8
- ER-2
- Citation

Radars

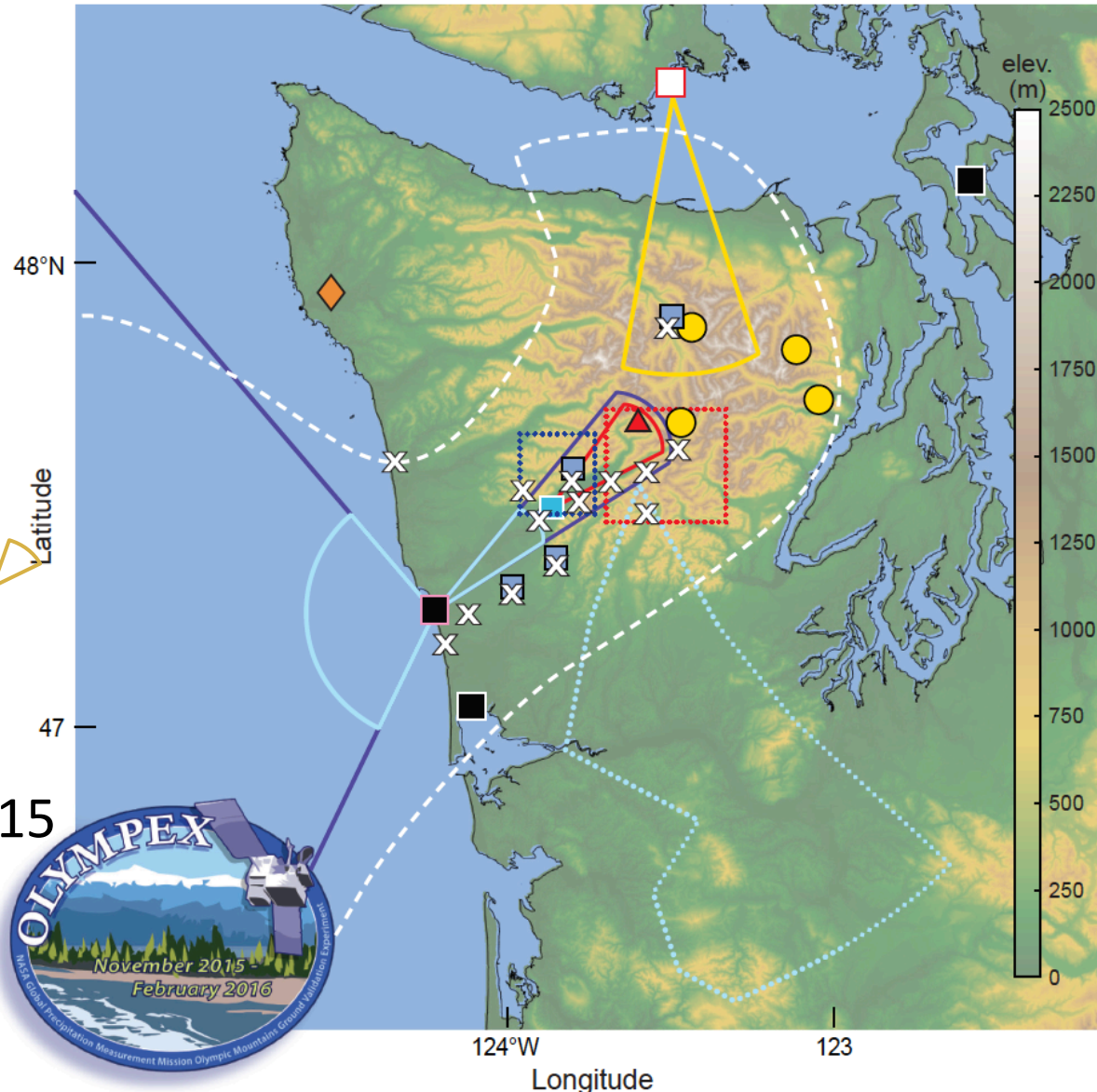
- NPOL
- D3R
- DOW
- EC X-band
- MRRs
- WSR-88D

Soundings

- ◆ KUIL
- NPOL
- EC X-band

Ground Network

- Rain Gauges
- ⊗ Disdrometers
- PIP
- Snow Cameras

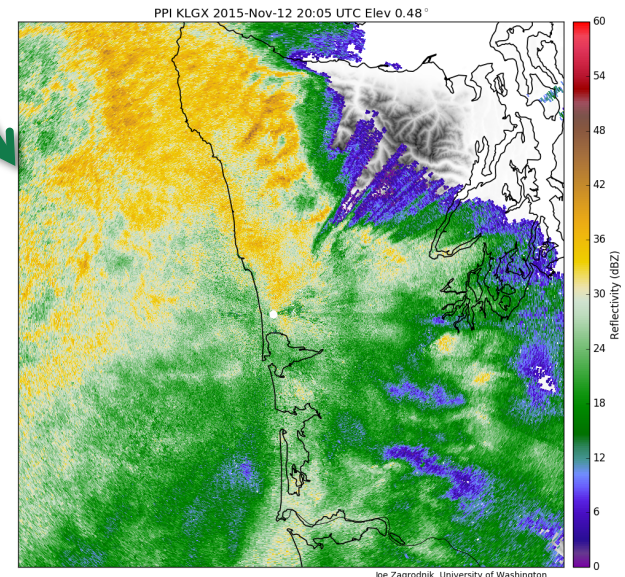
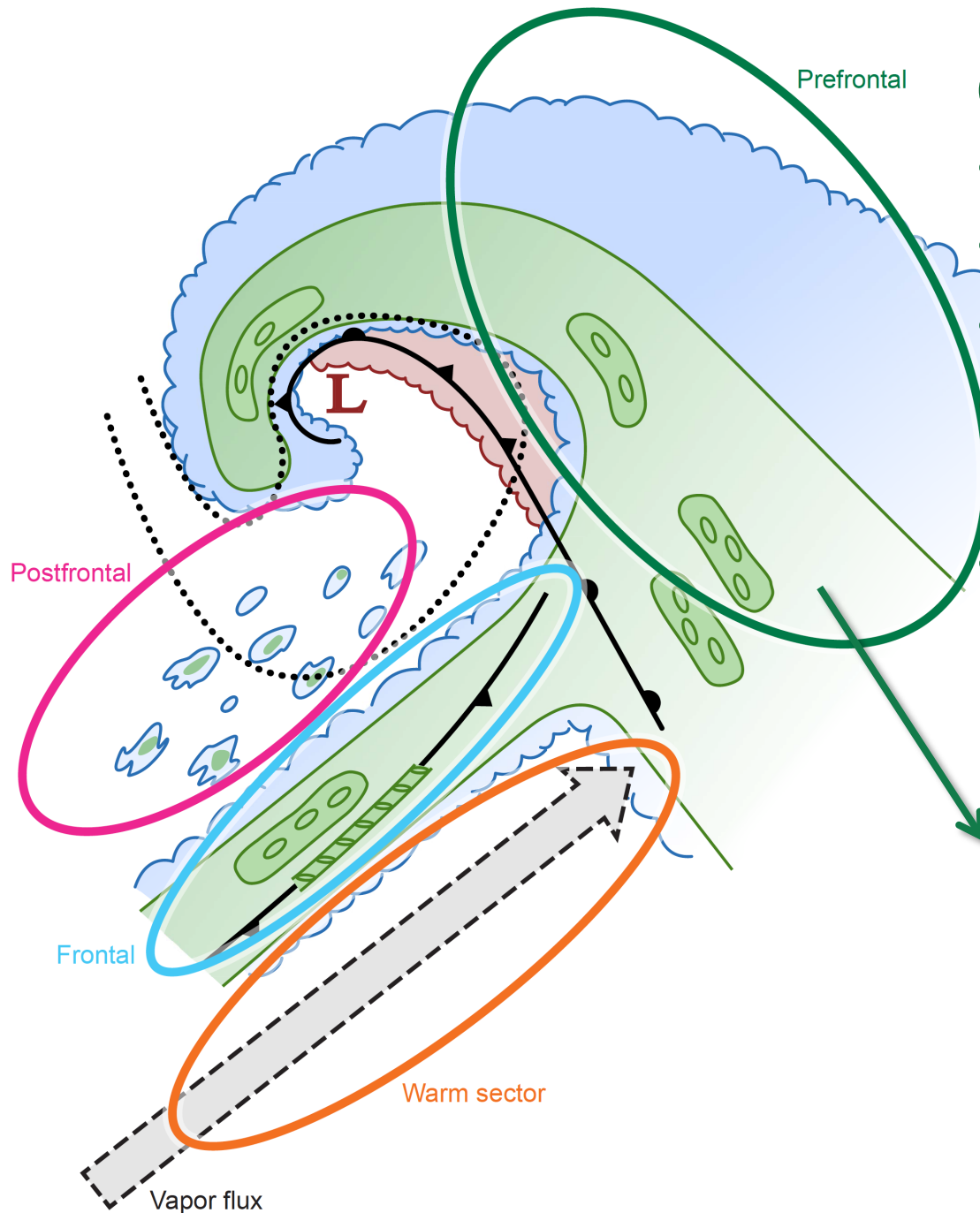


Nov – Dec 2015

Oct 2015 –
May 2016

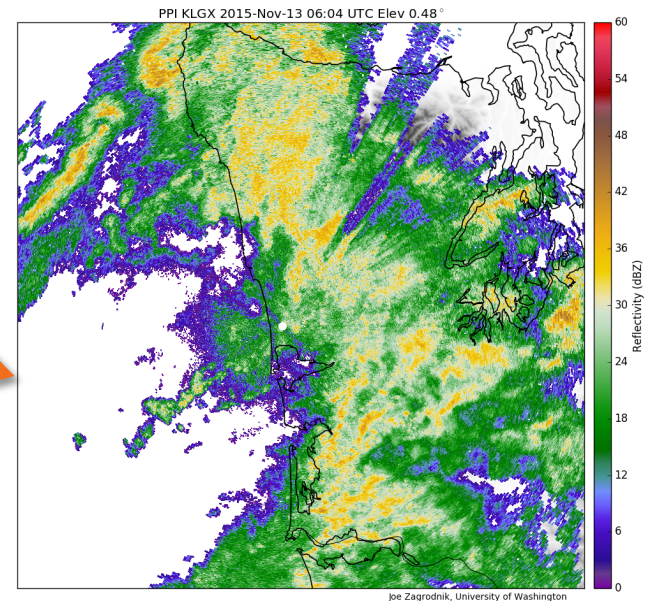
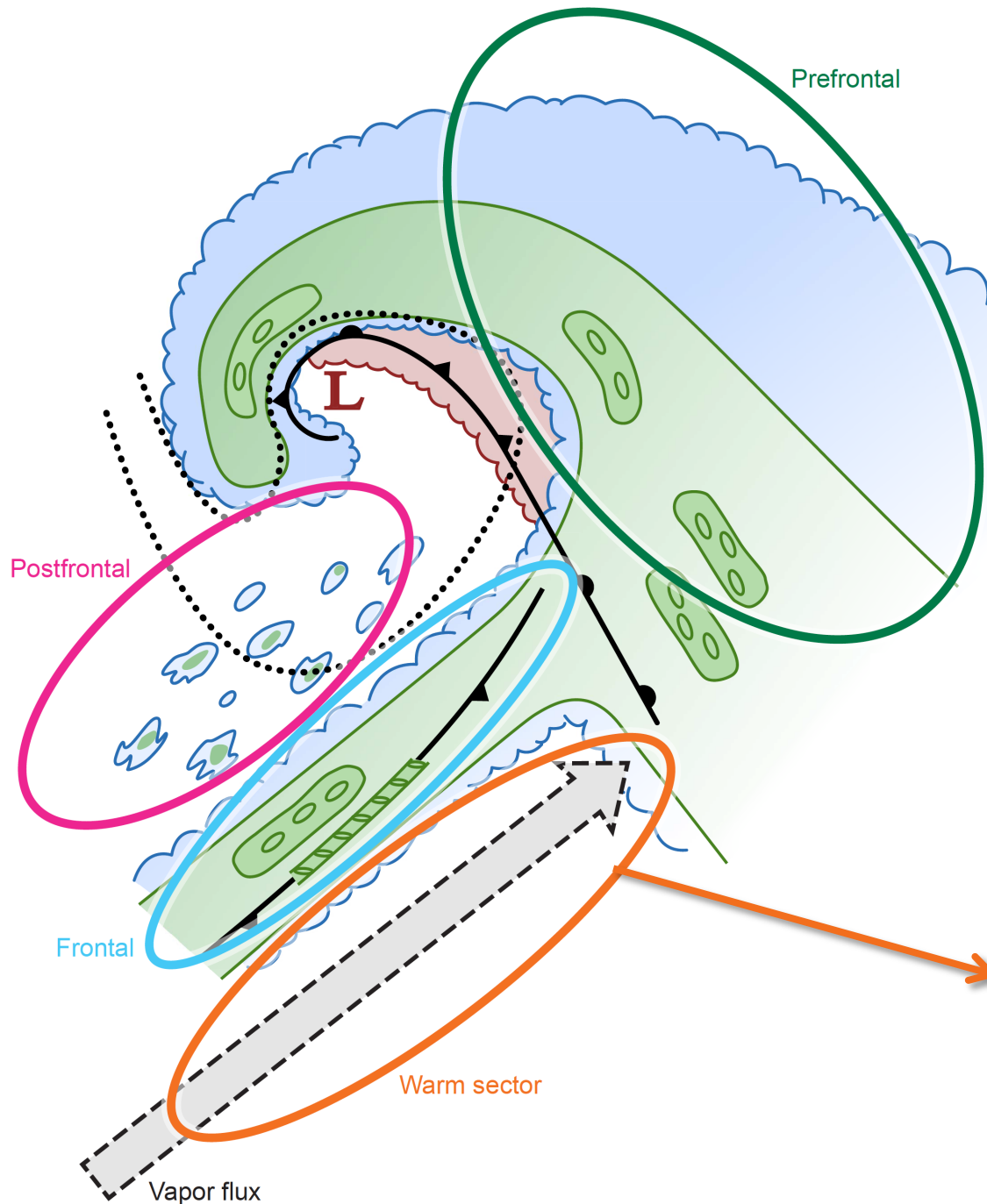
Prefrontal Environmental Characteristics

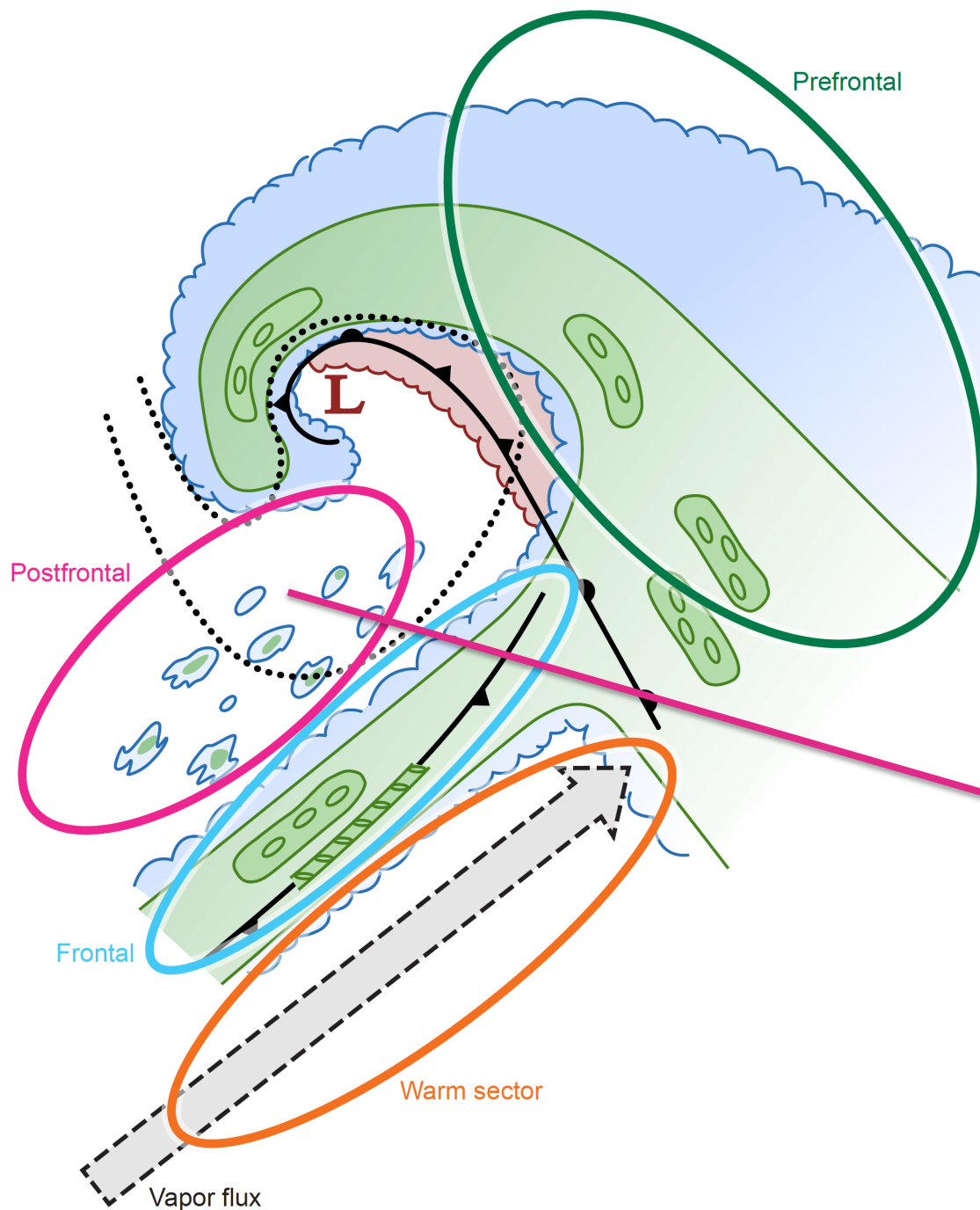
- Warm advection
- Stable
- Low-level SE flow
- IVT variable (can be high)
- Increasing Melting Level height



Warm Sector Environmental Characteristics

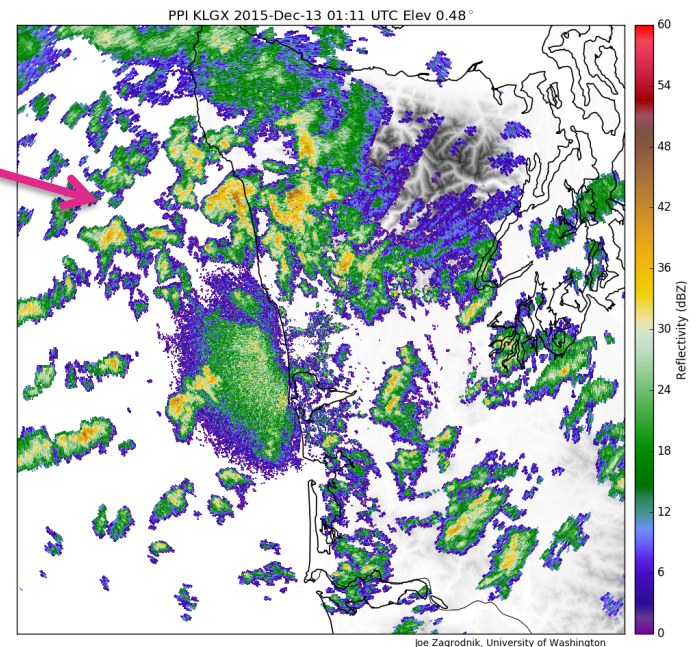
- High IVT
- Neutral Stability
- SW flow
- High melting level





Postfrontal Environmental Characteristics

- Cold Advection
- Unstable
- W or NW flow
- Low IVT
- Low Melting Level



Orographic Enhancement of Precipitation Structure Seasonal Statistics

- from Rain Gauges
- from Radar

OLYMPEX Precipitation

Prairie Creek
Elevation 540m

Fisheries
Elevation 50 m

4326

2468

2876

3511

4021

4873

4225

3444

3183

1898

2332

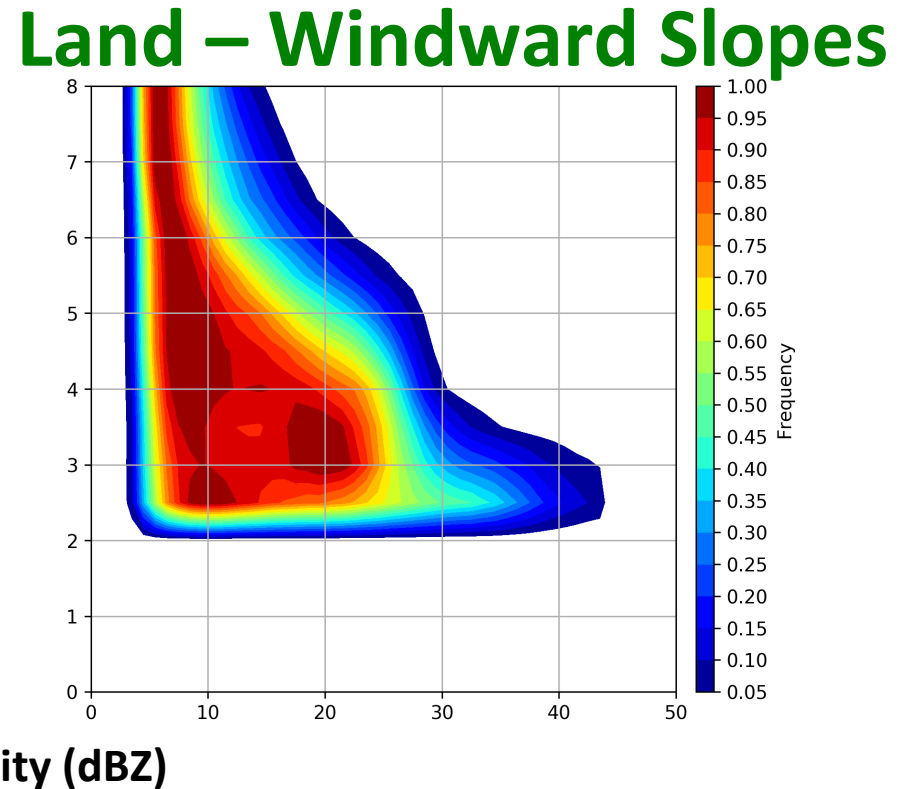
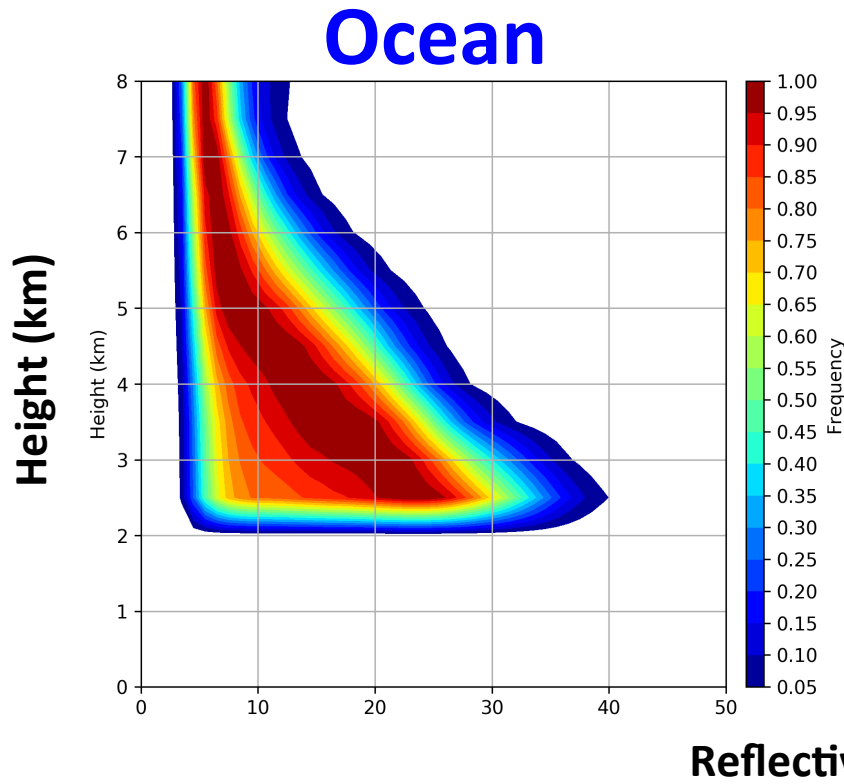
1723

Accumulated precipitation (mm)
10 Nov 2015 – 1 May 2016

~ from 65 frontal systems

How does this pattern vary? With storm
sector? Environmental conditions?

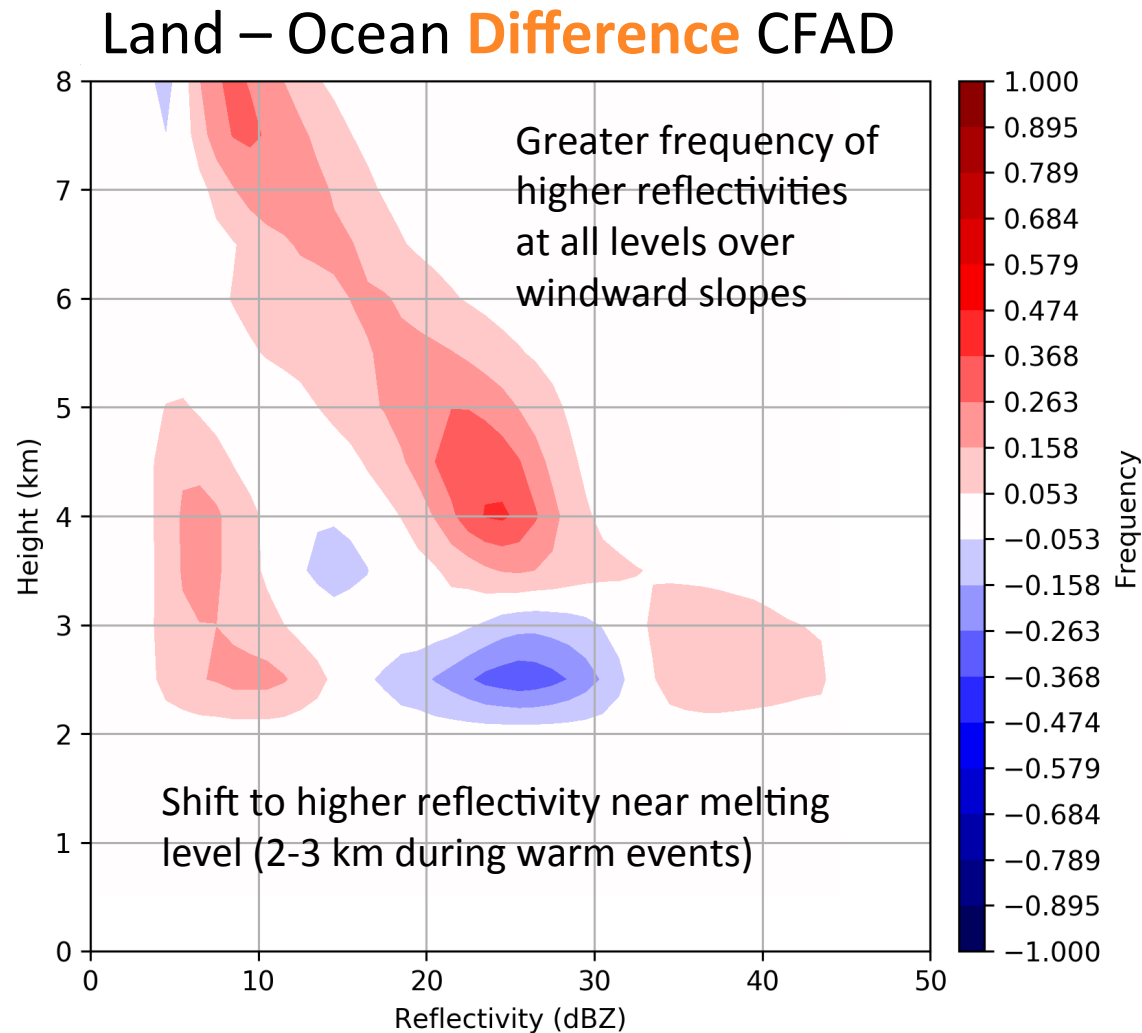
Orographic Enhancement Aloft from Radar



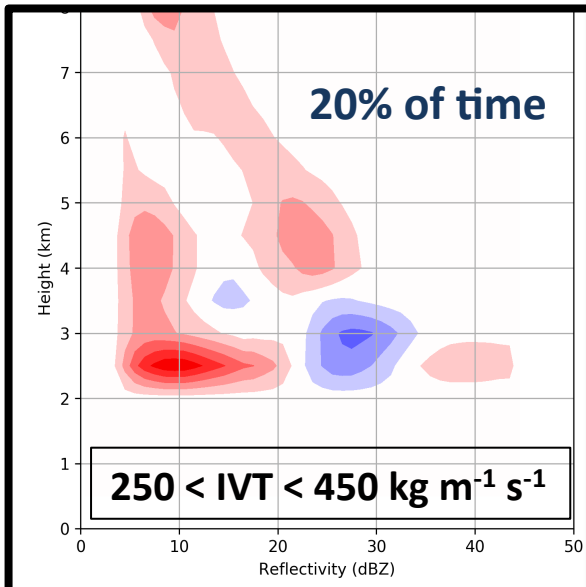
Contoured Frequency by Altitude Diagrams

Frequencies normalized by level for **all NPOL RHI data** over ocean and land above 2 km height

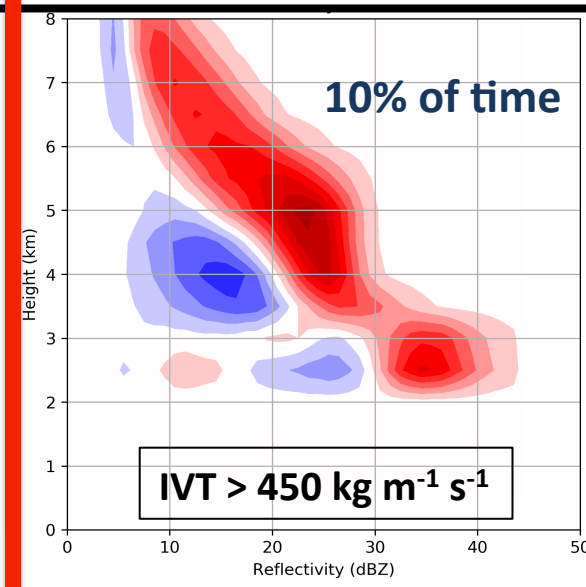
Orographic Enhancement Aloft



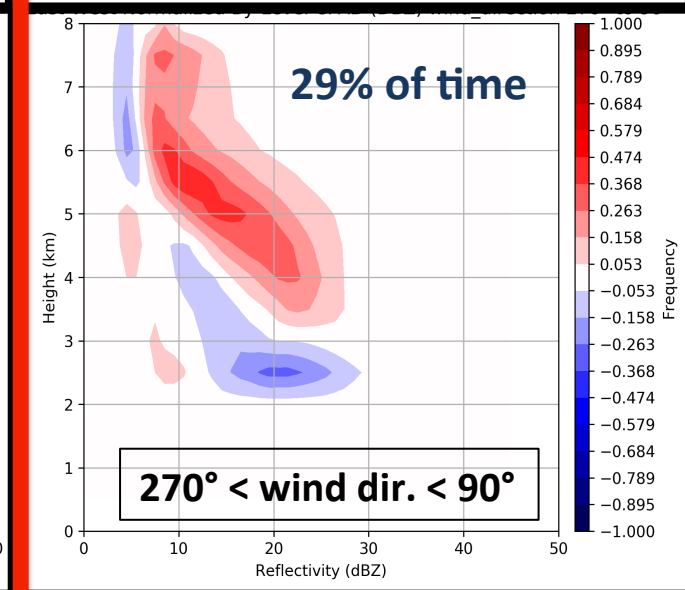
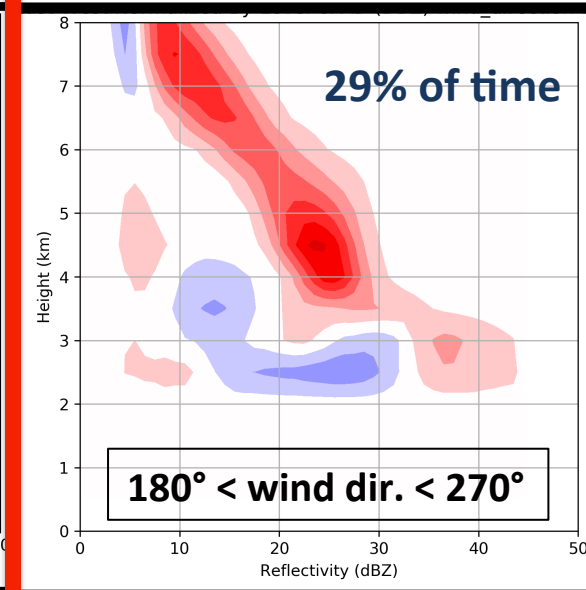
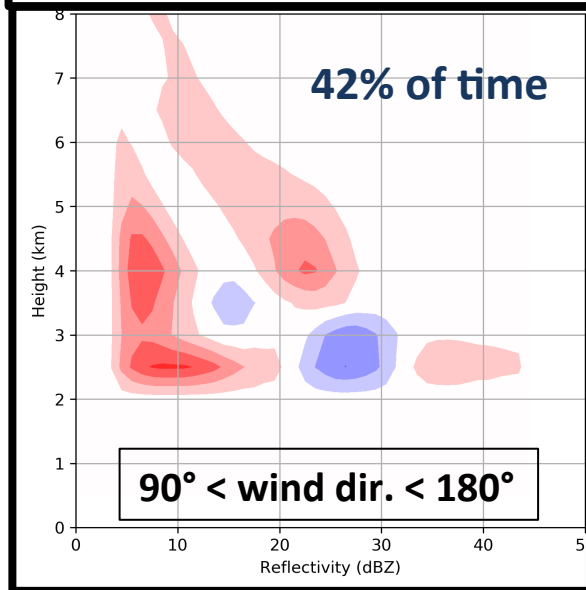
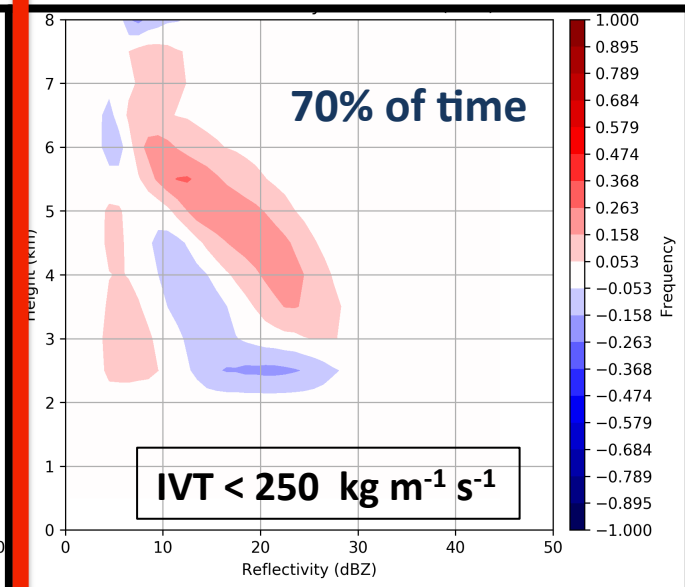
~Pre-frontal



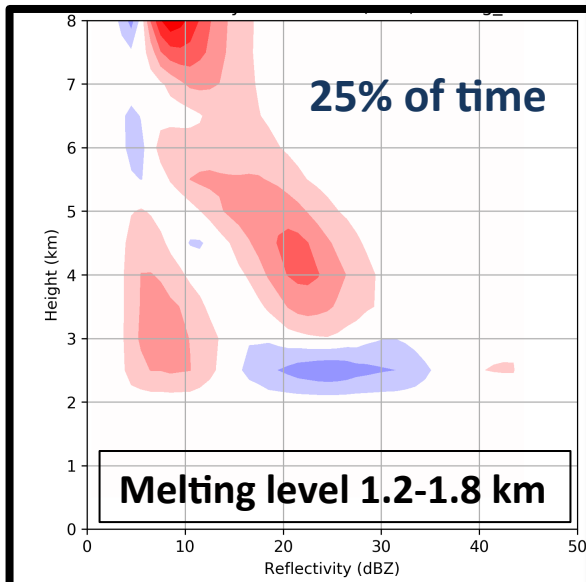
~Warm sector



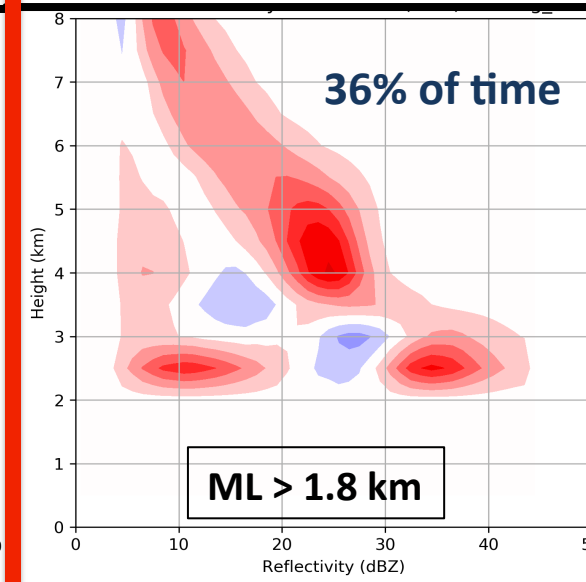
~Post frontal



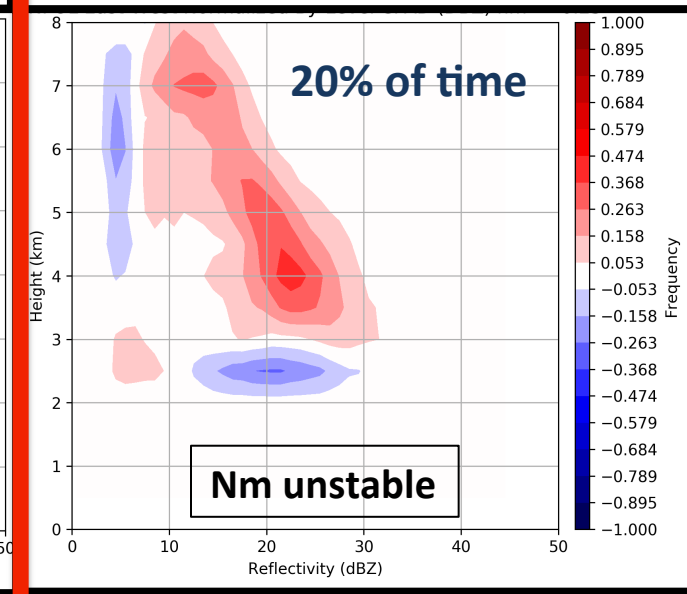
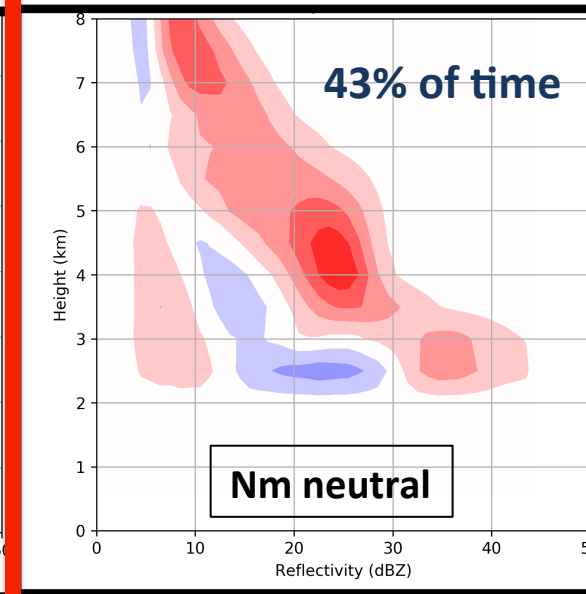
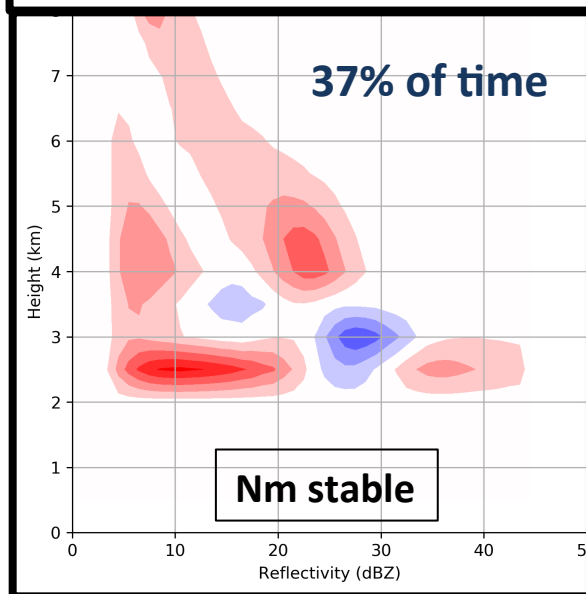
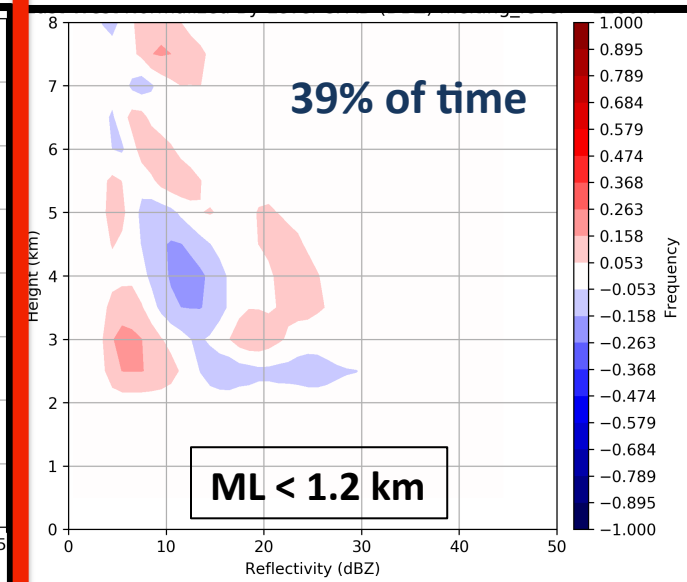
~Pre-frontal



~Warm sector



~Post frontal

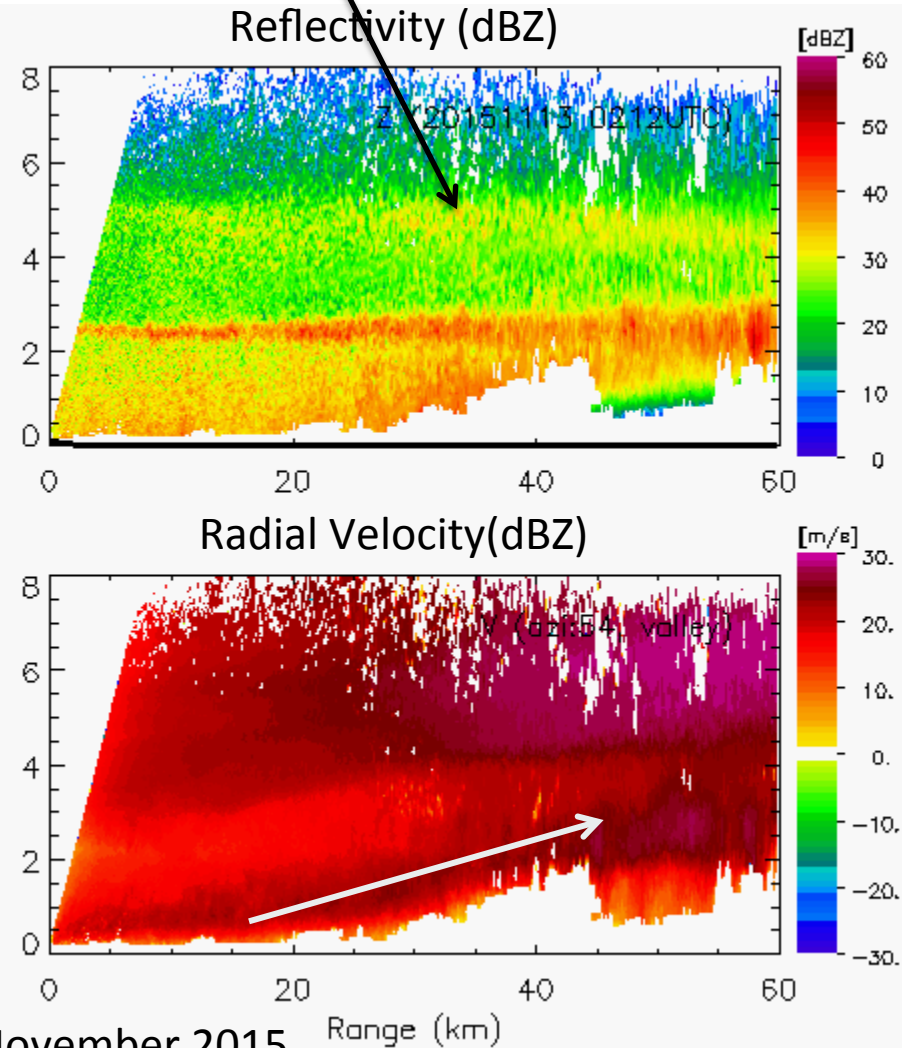
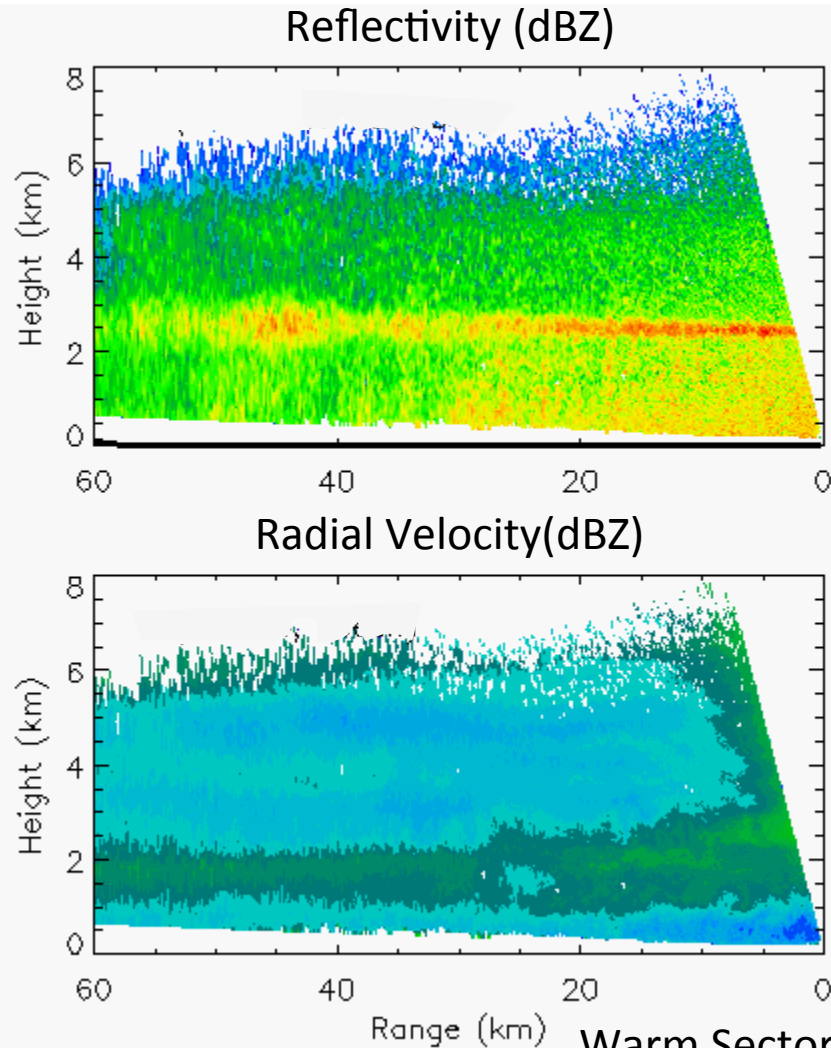


Strongest enhancement during in warm sector with atmospheric river like conditions

Enhancement at both upper and lower levels

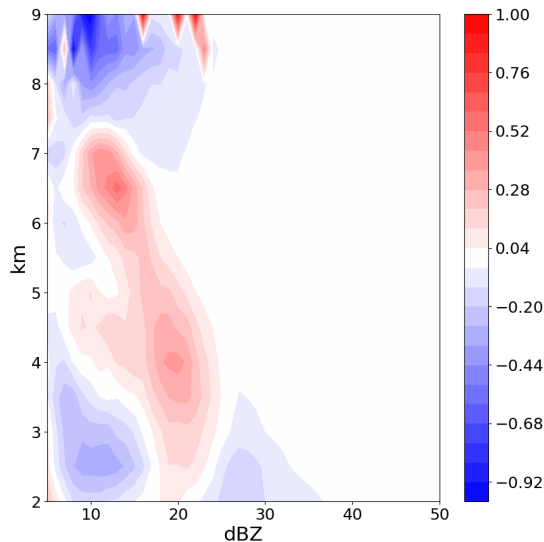
Ocean

Land



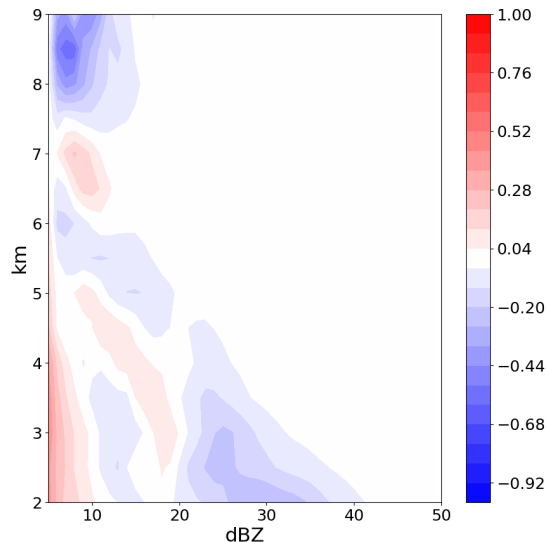
NPOL Ocean **Difference** EC X-band CFAD Leeseide

Unstable



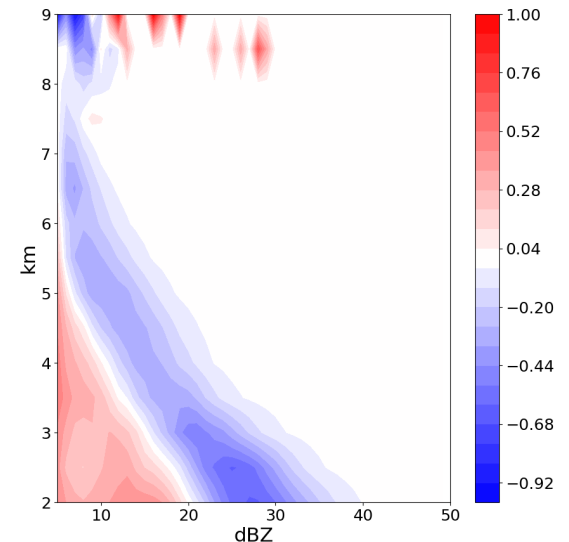
Leeseide – not always the lee side in Post-frontal environment

Neutral



Some 'de-enhancement', but some precip gets across

Stable

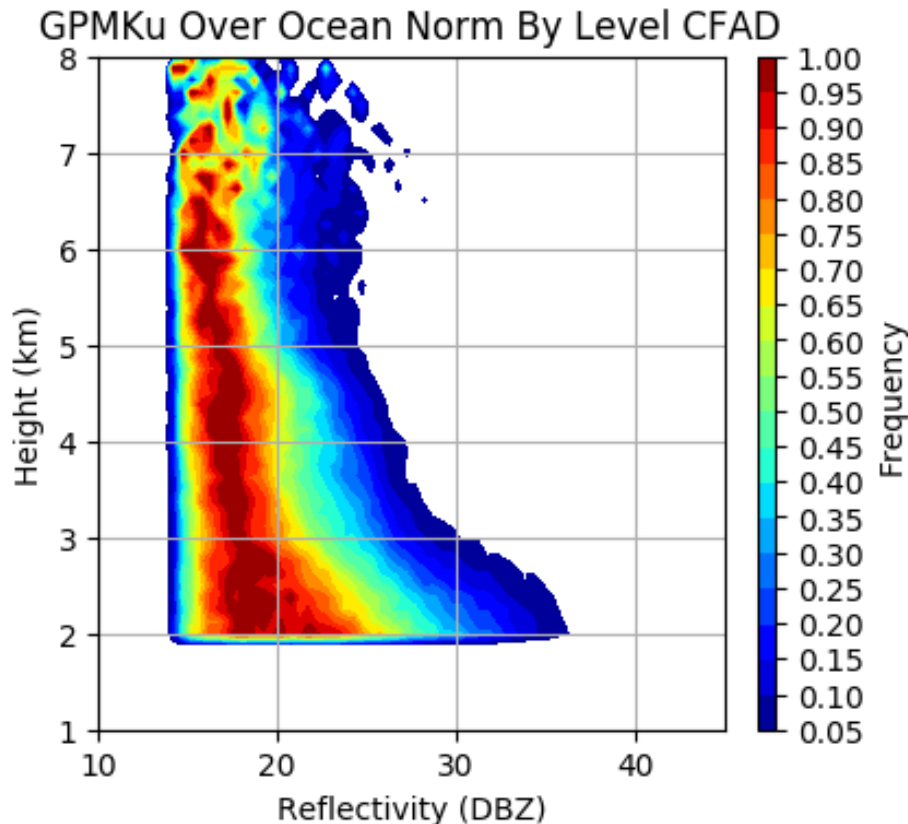


Precipitation particles cannot get across high terrain

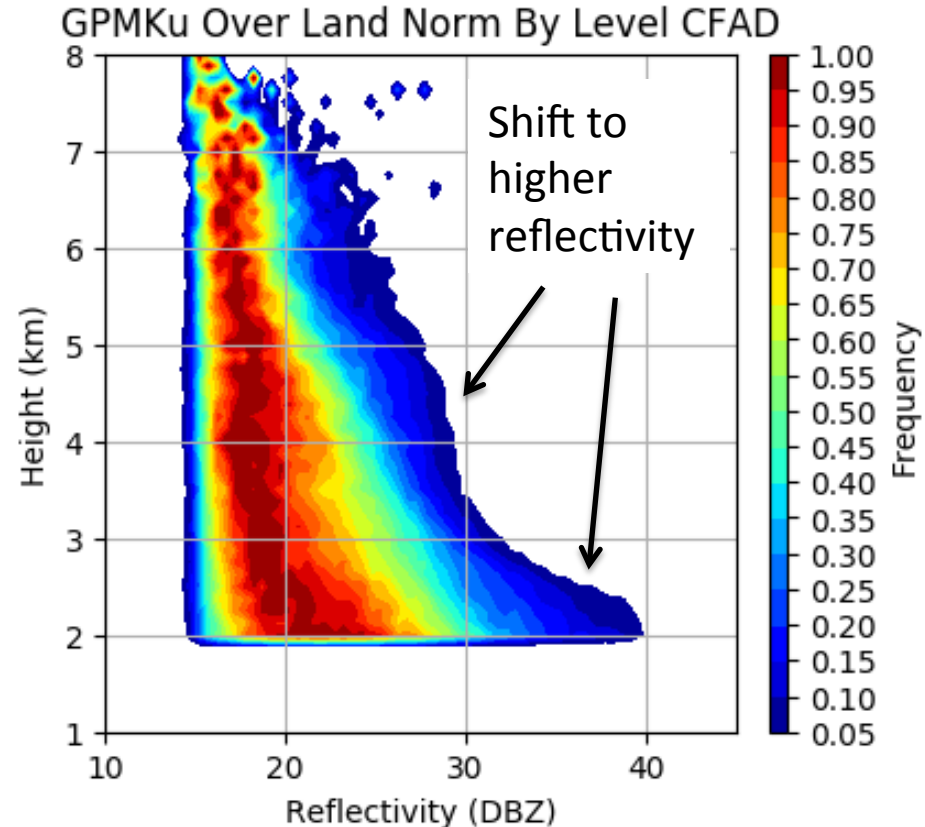
Can enhancement aloft can be seen



Ocean

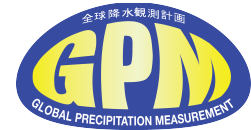


Land

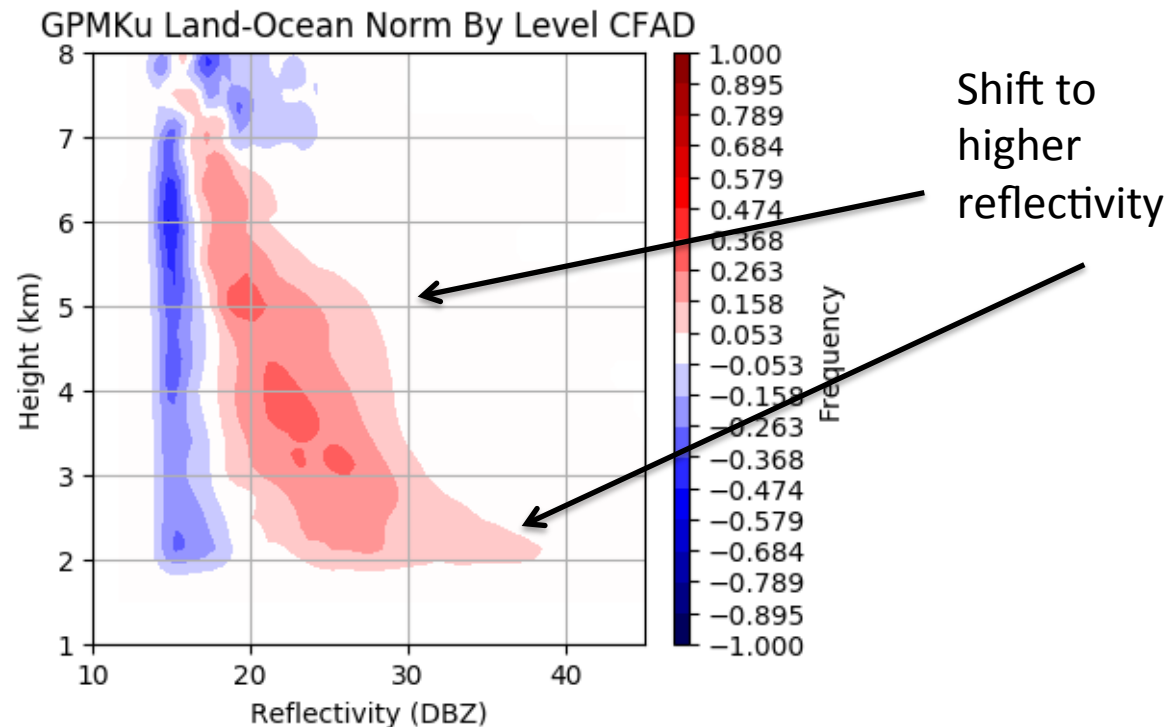


- Used all GPM overpasses since launch and during cold season NDJFM
- Ocean box (46.5—48.6°N 126.4—124.7°W)
- Land box (46.5—48.6°N 124.3—122.6°W) Olympic Peninsula

Can enhancement aloft can be seen



Land minus Ocean



- Used all GPM overpasses since launch and during cold season NDJFM
- Ocean box (46.5—48.6°N 126.4—124.7°W)
- Land box (46.5—48.6°N 124.3—122.6°W) Olympic Peninsula

What we are learning from OLYMPEX

- Enhancement of the precipitating cloud system occurs aloft
- Synoptic and environmental conditions affect the degree of enhancement
- Enhancement on windward slopes greatest during warm, strongly forced events
- More details up next
 - **Joe** – Atmospheric Rivers
 - **Angela** – Enhancement aloft (microphysics from aircraft)
 - **Robert** – High resolution modeling and KH waves
 - **Joe** – Cloud and precipitation structure across all regions (ocean → windward → high terrain → leeside)

A scenic mountain landscape with a waterfall and mist. The image shows a steep, forested mountain slope with a waterfall cascading down. The foreground is a grassy field with some trees, and the background is a misty, mountainous valley. The text is overlaid on the center of the image.

Acknowledgements

Work Supported by:

- NASA grants: NNX16AD75G, NNX16AK05G, 80NSSC17K0279
- NSF grants: AGS-1503155, AGS-1657251