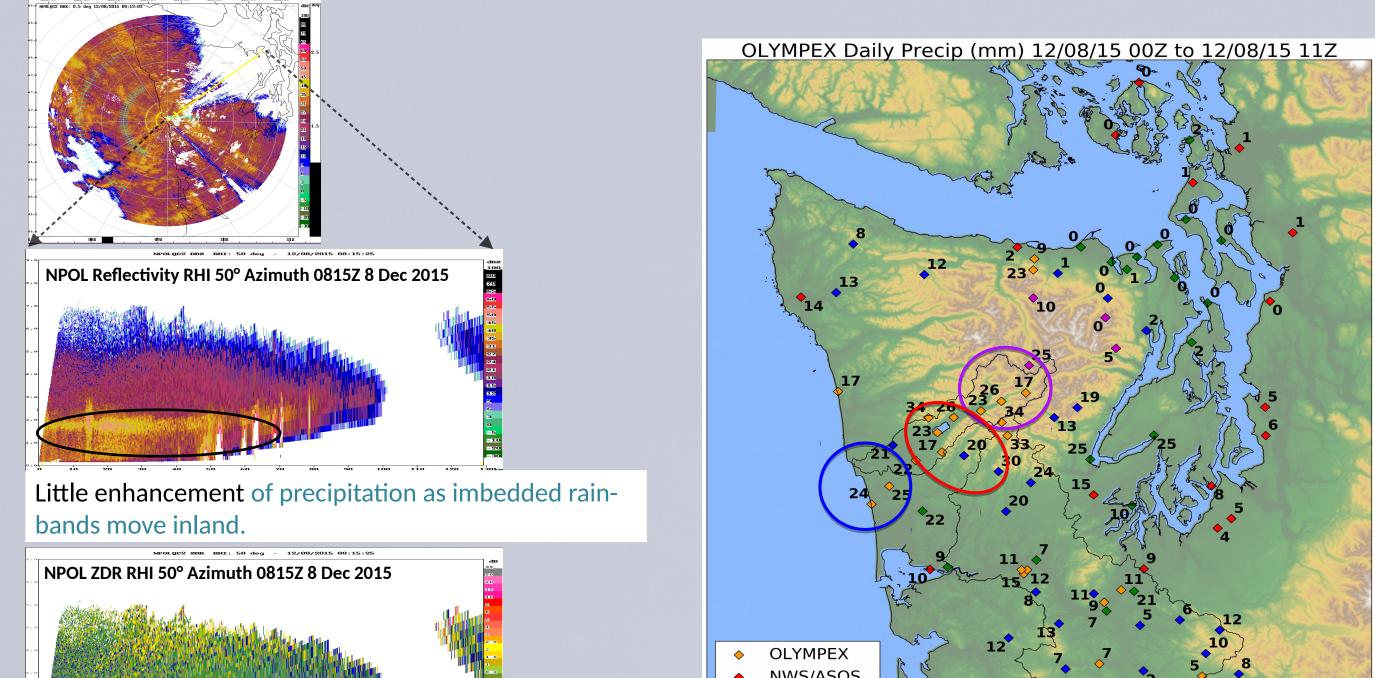


Orographic Precipitation Enhancement Over the Olympic Peninsula

Thomas Schuldt, Lynn McMurdie, Joseph Zagrodnik, Angela Rowe University of Washington, Seattle, WA





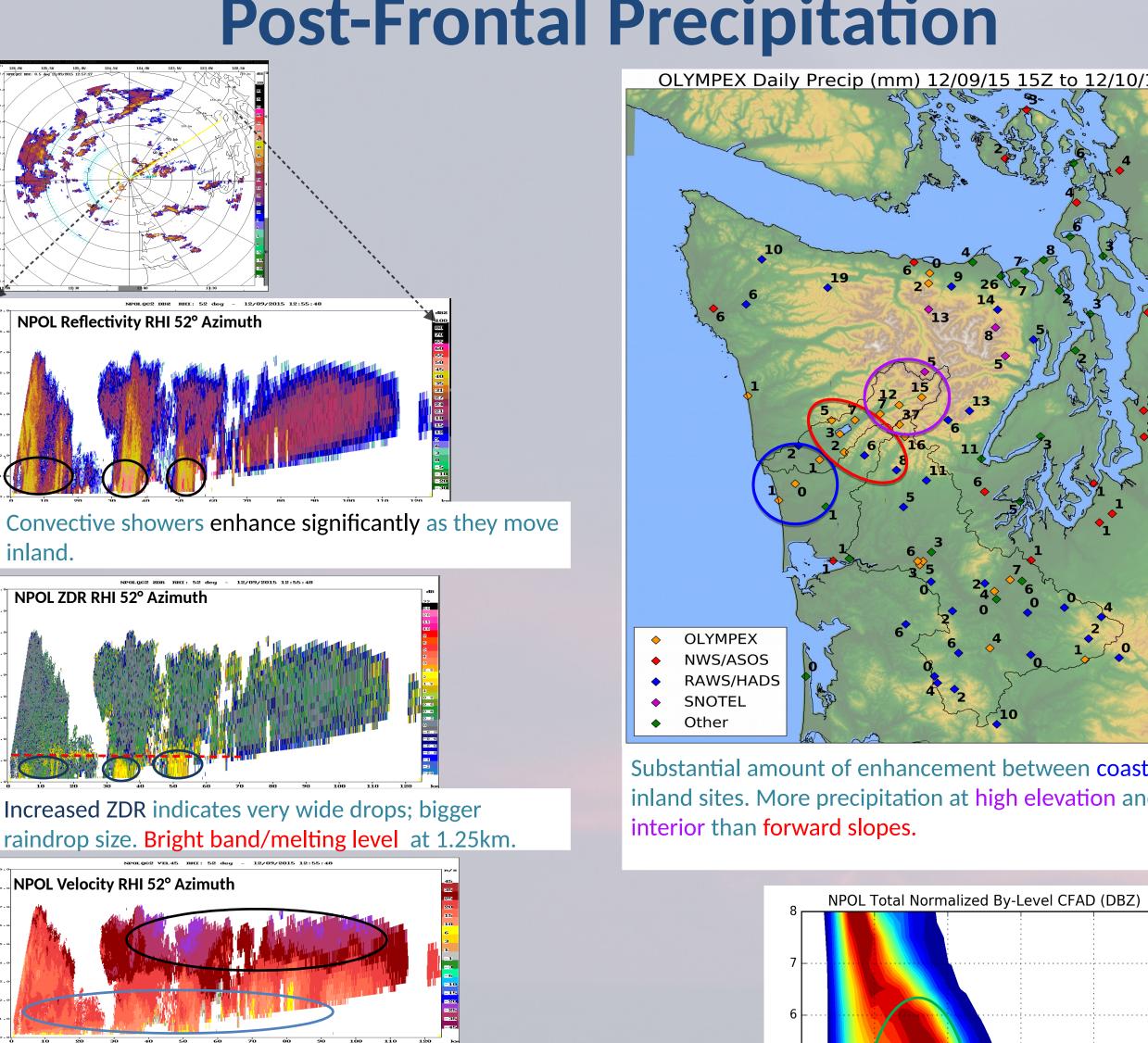


- Relatively uniform amounts of precipitation between the coastal, forward slopes, and high elevation/interior
- ighter winds near the surface and stronger winds aloft Gauges reported a steady increase in precipitation with little variation
- between geographical location. Southwesterly flow combined with warm front approaches, moderate reflectivity pre-frontal synoptic conditions yield in the lower part of the atmosphere, decreases with height above melting level. little to no orographic enhancement.

nd/melting level at 1.75km

Melting level starts low and increases as

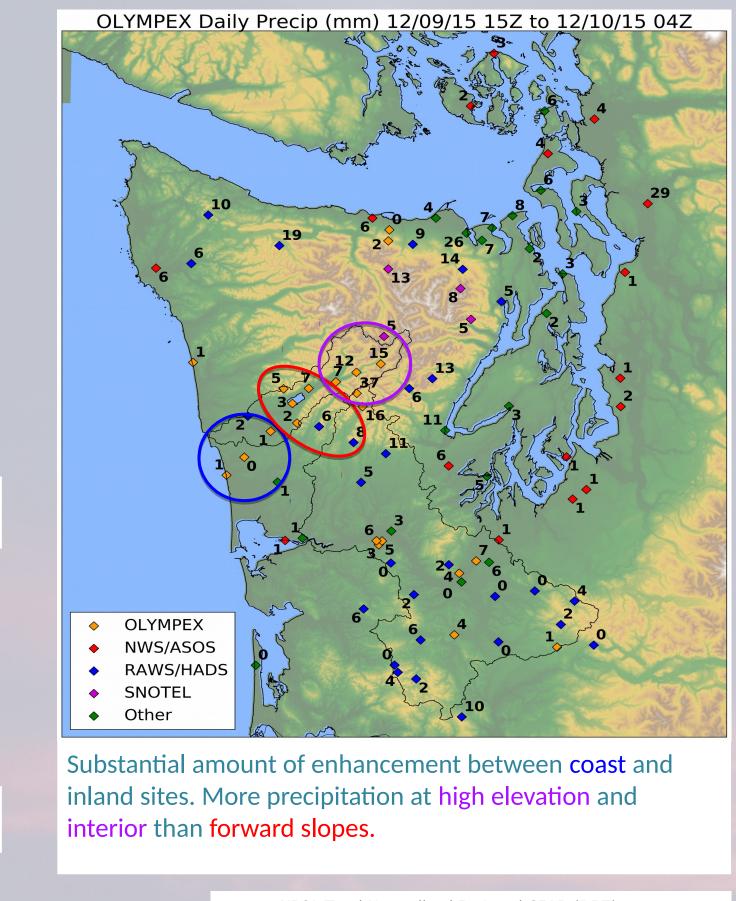
Post-Frontal Precipitation



 Gauges near the coast observe very little precipitation with elevated interior locations receiving substantially more.

winds aloft with high vertical shear

 The Westerly flow combined with convective post-frontal conditions show significant orographic enhancement for inland locations

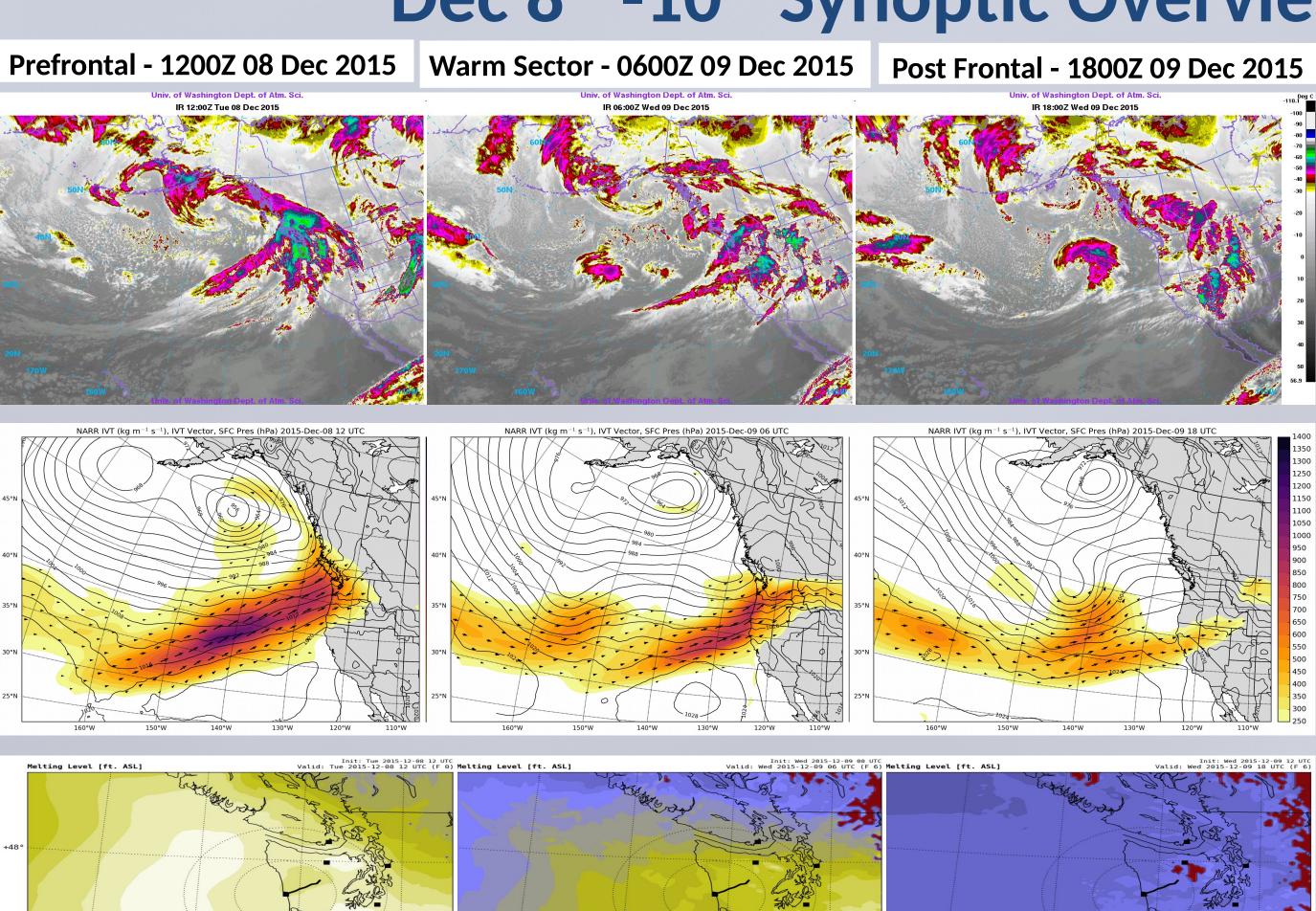


- Precipitation enhancement near the surface is pronounced in the lower portion of the atmosphere, reflectivity remains relatively constant with height due to the convective nature of the precipitation.

OLYMPEX Goals & Field Campaign Overview

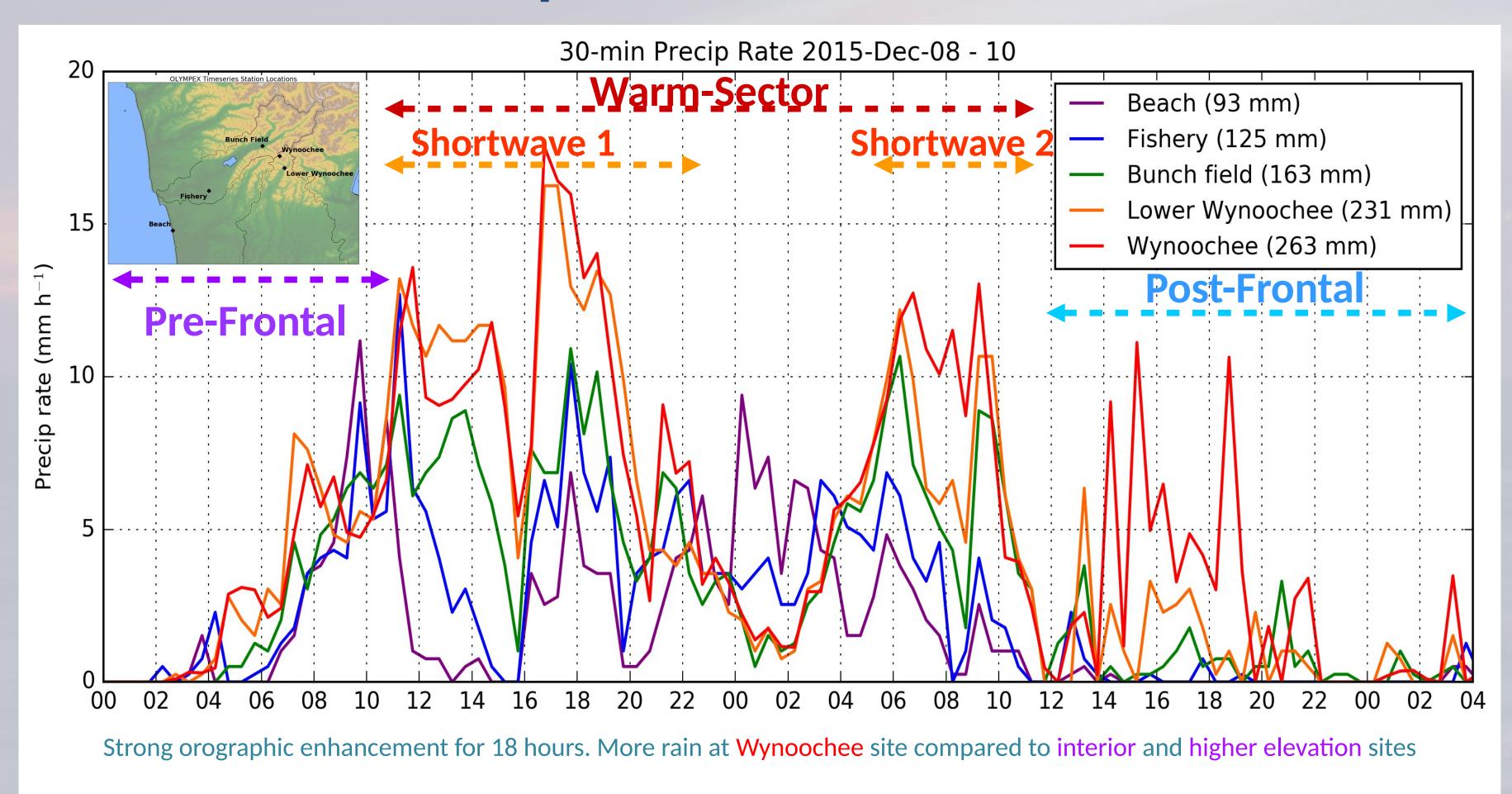
- Physical validation and verification of precipitation measurements by the GPM satellite.
- Measure precipitation processes and their modulation by synoptic conditions and complex terrain.
- OLYMPEX regions included ocean, windward side, high terrain and leeside and the Quinault and Chehalis river basins
- •NPOL radar on coast sampled ocean and windward side, the Doppler on Wheels (DOW) sampled up the Quinault Valley. Both radars were supported by a ground network of disdrometers, rain gauges and MRRs.

Dec 8th -10th Synoptic Overview



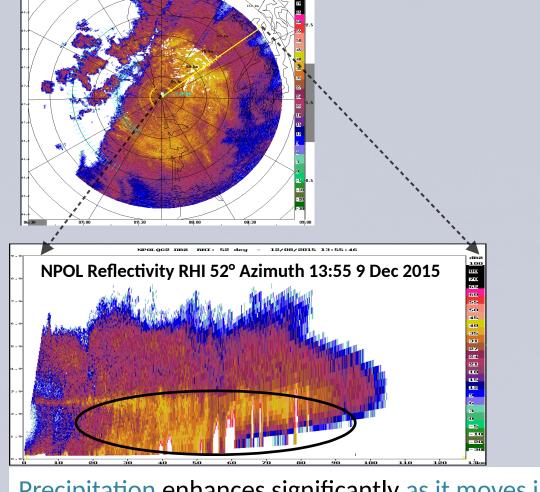
- Atmospheric river event which includes pre-warm front, warm-sector, and convective Postfrontal conditions.
- Warm-sector contains two embedded shortwaves with an Intermediate period of blocked flow.
- Melting level remains high for much of the event, with a sharp decrease in the Post-Frontal Sector.

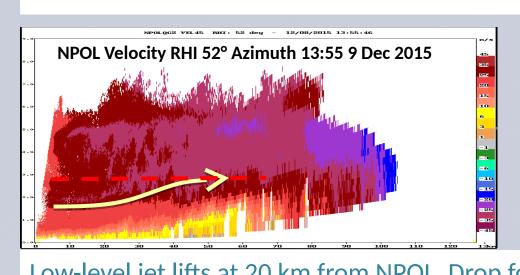
Event Precipitation Time-Series



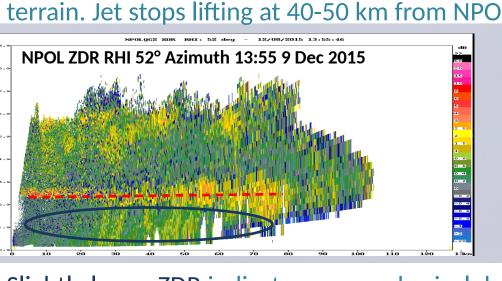
Warm-Sector Precipitation

Shortwave 1&2





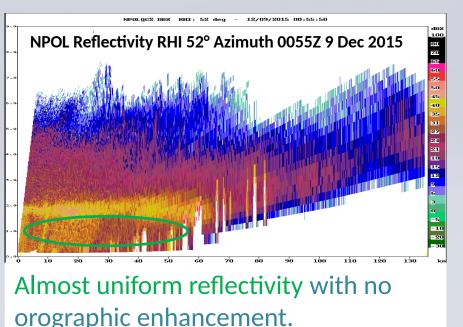
and growth occurs below melting level ahead o



Slightly lower ZDR indicates more spherical drops; smaller raindrop size. Melting level at 2.75km.

- Gauges reported significant variation in precipitation rates between coastal and inland locations.
- Southwesterly flow combined with a low level jet and high melting level produce strong orographic enhancement along the windward slopes of the Olympics.

Intermediate Period Dec 8th 21Z - Dec 9th 5Z



Low level winds are offshore with blocked low flow.

Higher ZDR indicates wider drops; large raindrop size. Melting level at 1.75 km.

Difference in reflectivity between east

(inland) and west (ocean) shows a broad

increase in reflectivity across all levels of the

atmosphere as precipitation moves onshore.

More precipitation at forward slopes than high elevation

and interior locations

• Gauges record similar rain rates especially on the forward slopes and higher elevations. Southerly flow with an offshore low level component provides no orographic enhancement and orientation of flow allows coastal sights to receive more precipitation

Summary

- Deep, stratiform precipitation with a high melting level and low level jet produce strong orographic enhancement through warm rain processes along initial windward slopes.
- Post-frontal conditions with a low melting level and convective cells are associated with a greater degree of enhancement over interior locations.
- Pre-frontal and blocked flow conditions show no significant level of enhancement between coastal and inland sites.

Acknowledgments

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