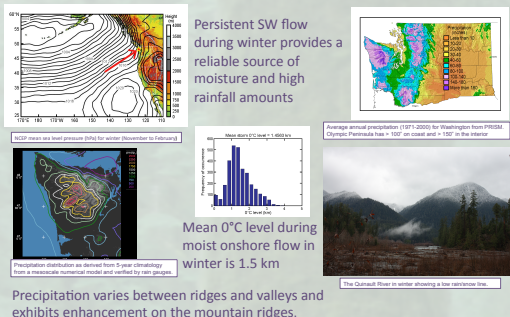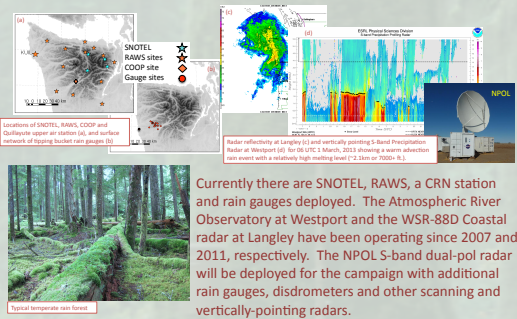# OLYMPEX – A Ground Validation Field Campaign on the Olympic Peninsula in the Pacific Northwest

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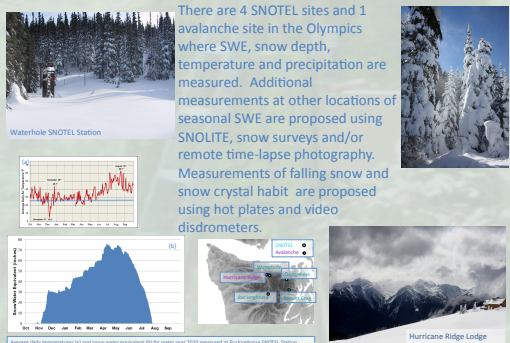
Climatology of the Olympic Peninsula

Persistent SW flow during winter provides a reliable source of moisture and high rainfall amounts

Average annual precipitation (1971-2000) for Washington from PRISM. Olympic Peninsula has ~ 100" on coast and ~ 150" in the interior

Mean 0°C level during moist onshore flow in winter is 1.5 km

Precipitation varies between ridges and valleys and exhibits enhancement on the mountain ridges.

Rain Measurements in the Olympics

SNOTEL
RAWS sites
COOP site
Gauge sites

Currently there are SNOTEL, RAWS, a CRN station and rain gauges deployed. The Atmospheric River Observatory at Westport and the WSR-88D Coastal radar at Langley have been operating since 2007 and 2011, respectively. The NPOL S-band dual-pol radar will be deployed for the campaign with additional rain gauges, disdrometers and other scanning and vertically-pointing radars.

Snow Measurements in the Olympics

There are 4 SNOTEL sites and 1 avalanche site in the Olympics where SWE, snow depth, temperature and precipitation are measured. Additional measurements at other locations of seasonal SWE are proposed using SNOLITE, snow surveys and/or remote time-lapse photography. Measurements of falling snow and snow crystal habit are proposed using hot plates and video disdrometers.

Overview

During the 2016 water year (Fall 2015 – Winter 2016), a Ground Validation Field Campaign for the Core satellite of the Global Precipitation Measurement (GPM) will occur on the Olympic Peninsula. The main purpose will be to validate the algorithms for the GPM Microwave Imager (GMI) and the Dual Frequency Precipitation Radar (DPR) for precipitation (both frozen and liquid) in the midlatitudes in a region of complex terrain, with transitions from ocean to coast to lowlands to high terrain.

Science Focus

Several important scientific issues will be addressed with the measurements obtained during the field campaign. These include:
- Physical validation of algorithms
- Rain and snow mechanisms in complex terrain
- Hydrological applications of the GPM measurements
- Numerical modeling of precipitation processes and algorithm physics

Field Campaign

The field campaign will focus on the extreme precipitation and its modification from ocean to the complex terrain of the Olympic Peninsula with emphasis on two major river basins: the Quinault, which has its headwaters in high terrain and the Chehalis, which is a broader river draining from lower terrain.


Proposed Observations

- Surface instruments could include:
  - SNOTEL, RAWS and Climate Reference Station
  - High density rain gauge networks
  - Video disdrometer
  - Hot Plates and Pluvio weighing gauges
  - Snow Surveys and time-lapse photography
- Radars:
  - Coastal WSR-88D at Langley
  - Atmospheric River Observatory at Westport
  - NASA NPOL S-band dual-pol radar, D3R radar
  - Other Radars such as the DOW, or X-band and W-band radars are possible
- Aircraft:
  - DC-8, North Dakota Citation
  - Other aircraft could include Wyoming King Air, ER-2, Canadian Convair

Hydrology

One of the main goals of GPM is to provide precipitation estimates for input into hydrological applications such as forecasting flood events and water supply. OLYMPEX will focus on the Quinault and the Chehalis river basins.

Modeling

The WRF mesoscale numerical model is run real time for 2 forecast cycles and at several resolutions everyday at the University of Washington (http://www.atmos.washington.edu/mm5rt/). The output will be crucial for operation support during the OLYMPEX field phase. In addition, the higher resolution runs (4km, 1.3 km) will be used to model precipitation processes in complex terrain, for input to hydrological models to estimate snowpack accumulation and for developing and verifying precipitation algorithms.
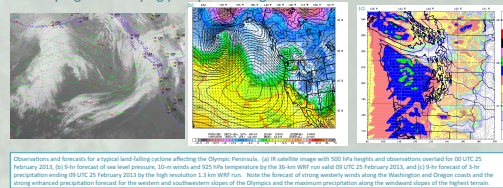
Challenges and Opportunities

- The Olympics are a natural laboratory for midlatitude precipitation studies.
  - High rainfall amounts and relatively low melting level
  - Complex terrain leading to highly variable distribution of precipitation
  - Transition from ocean to coast to land in a relatively compact area
  - West coast flooding due to fronts crossing mountains
- These same characteristics are also challenges for algorithm development and understanding orographic precipitation processes.
- Measurements from OLYMPEX will bring GPM closer to the goal of monitoring snow and rain on all ranges of scales at all locations globally and applying these measurements to weather forecasting, flood monitoring and water supply.