OLYMPEX: A Ground Validation Campaign on the Olympic Peninsula in the Pacific Northwest

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The Global Precipitation Measurement (GPM) Mission, scheduled for launch in early 2014, will provide the next-generation of unified global precipitation data products spanning the range from liquid to frozen precipitation types. GPM satellite measurements will provide surface measurements of rain and snow, especially over remote regions such as the oceans and mountainous areas. The GPM will be instrumented with the first space-borne Ku/Ka-band Dual-frequency Precipitation Radar (DPR) and the GPM Microwave Imager (GMI), a passive microwave instrument with high frequencies sensitive to both rain and snow particles. In order to satisfy GPM measurement requirements for estimation of precipitation type and intensity, and for assessing a range of GPM data applications to include determination of storm structures, and incorporation of the satellite observations into hydrological and numerical weather prediction forecasts, ground validation (GV) field campaigns are vital. As such, GPM GV is planning for an Olympic Peninsula Experiment (OLYMPEX) field campaign to be conducted along the Olympic peninsula of Washington State during water year 2016 (November 2015 through February 2016). OLYMPEX will be developed to validate GPM rain and snowfall estimates, retrieval algorithm physics, and product utility for weather and hydrometeorological prediction over complex terrain.

Mountainous regions modify the precipitation processes in passing storms. They also act as a way to store water through the accumulation of snowfall, and the river valleys in complex terrain channel the runoff from both melting snow and rain. In order for GPM to obtain an accurate picture of the global water cycle, the satellite algorithms need to be developed and tested through a ground validation effort in mountainous terrain. The Olympic Peninsula is a natural laboratory for such a field campaign. Located in the northwest corner of Washington State, situated within the active Pacific storm track, the Olympic Peninsula receives among the highest annual precipitation amounts in North America., with annual totals ranging from over 2500 mm on the coast to about 4000 mm in the mountainous interior. In one compact area, the Olympic peninsula ranges from ocean to coast to land to mountains. This unique venue offers a field campaign opportunity to monitor both upstream precipitation characteristics and processes over the ocean and their modification over complex terrain.

The scientific goals of the OLYMPEX field campaign include physical validation of satellite algorithms, precipitation processes in complex terrain, hydrological applications and modeling studies. In order to address these goals, a wide variety of existing and new observations and instrumentation is planned. These include an *in situ* surface observing network of meteorological stations, rain gauge networks, snow gauge (including hot plates and Pluvio weighing gauges), 2D Video, Parsivel and Joss Distrometers, SNOTEL sites and river gauges. Helicopter surveys of the snowfield are under consideration. Surface-based remote instrumentation will include the existing NOAA/NWS WSR-88D coastal radar at Langley, WA, and the NOAA/ESRL Atmospheric River Observatory at Westport, WA, and planned additional radars such as the NASA N-Pol S-Band dual-polarimetric and NASA Dual-Frequency Dual-Polarimetric Doppler (D3R) scanning radars for PPI and RHI scanning over the west slopes of the Olympics, a potential scanning C-band radar to cover rain over lower hills, and several other mobile vertically-pointing radars to document the precipitation structure in valleys blocked from the view of the scanning radars. Several instrumented aircraft are likely to participate. The NASA DC-8 will be equipped with a Ka-Ku band dual-frequency radar, plus passive microwave sensors that simulate those on the GPM Core satellite. The University of North Dakota Citation will measure *in situ* microphysics. The aircraft measurements will determine upstream thermodynamic and moisture conditions, sample particle types and sizes for comparison with those employed in the satellite algorithm, and act as a proxy for the satellite itself. The ground-based measurements will test how well the satellite proxy measurements determine the rain and snow over complex terrain. Although this is a NASA field campaign, participation of other agencies concerned with rain, snow, hydrology, and precipitation processes over complex terrain will add to the comprehensiveness and utility of the experiment.