

Measuring precipitation in complex terrain: Insights from the OLYMPEX field campaign

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During fall 2015 – winter 2016, the Olympic Mountains Experiment (OLYMPEX) was conducted on the Olympic Peninsula of Washington State to study precipitation in a region of complex terrain. In addition to serving as a Global Precipitation Measurement (GPM) mission ground validation project, OLYMPEX offers an excellent opportunity to investigate microphysical, dynamical, and kinematic processes responsible for orographically enhanced precipitation. Extensive observational assets spanning a range of elevations and altitudes, including a ground network of rain gauges and disdrometers, ground-based and airborne radar, soundings, dropsondes, and in situ airborne microphysical measurements, provide the means to characterize precipitating wintertime mid-latitude storms as they traverse from the coast to the high terrain and leeside. While a challenging task due to the nature of the terrain and amount of precipitation occurring that time of year, datasets resulting from the successful planning, deployment, and maintenance of these instruments are highlighting an important process-based understanding of heavy rainfall in mountainous regions.

While the nature of these mid-latitude cyclones and their associated precipitation differs from the tropical cyclones and mesoscale convective systems observed in Taiwan, insights from OLYMPEX can provide a valuable framework for designing future field campaigns in regions of complex topography. In particular, an important asset of OLYMPEX was a Doppler on Wheels (DOW) radar, positioned on Lake Quinault under the lowest beam of an S-band polarimetric radar located on the coast. By focusing vertical scans up the Quinault Valley, the DOW data provides a necessary look at the processes leading to orographic enhancement in the valley and adjacent windward ridges. The placement of vertically pointing radars and surface-based instruments (e.g., disdrometers) allows the analysis to be extended to the surface. Spiral ascents and descents by aircraft carrying cloud probes within the RHI sectors of the ground-based radars gives us the means to verify radar-inferred hydrometeor properties, and airborne radar extends these observations to the highest terrain where ground-based radar beams are blocked.

These, and additional, strategic considerations from OLYMPEX will be presented in the context of strategies employed during TiMREX with the goal of helping to design a successful future campaign for studying orographic precipitation in the mountainous areas of Taiwan.