7 - Analyzing Surface Precipitation Accumulations Upstream of the Olympic Mountains using High-Resolution Simulations and Observations: An OLYMPEX Case Study

Tuesday, June 28, 2022
4:15 PM - 5:00 PM
Prospector 3-4 (Sheraton Park City)

Abstract

Analysis of surface precipitation accumulations upstream, near-shore, and adjacent to the Olympic mountains from the 17 December 2015 case during OLYMPEX using high-resolution Weather Research and Forecasting (WRF) simulations, and observations from the NPOL dual-polarization radar show that strong down-valley flow coupled with a frontal jet led to the formation of long-lasting Kelvin-Helmholtz (KH) waves. High-resolution soundings investigate the role of low-level blocking on upstream precipitation enhancement. Past work shows that frontal systems often slow while approaching complex terrain if the Froude number is sufficiently low. Low-level blocking by stable air ahead of a front can modify precipitation distributions by frontal deformation, slowing, splitting, or merging. Observed coastal sounding profiles from OLYMPEX indicate little change in surface thermodynamic characteristics as the front propagated northeastward and stalled, a possible indication of blocking by the terrain. Initial findings from sounding-derived vertical stability parameters show high levels of low-level stability (~7.5 k km-1) and high vertical wind shear (dU/dz = 0.025 s-1). Precipitation accumulations from WRF simulations and OLYMPEX observations divide the event into five regions 100 km, 80 km, 40 km, 15 km, and 0 km upstream of NPOL and into timeframes relative to landfall to analyze the distribution of precipitation enhancement associated with a warm front. Preliminary results indicate that 40 km upstream of the coast saw nearly double 5-min precipitation accumulations compared to 15 and 0 km even though radar indicates that precipitation was stratiform across the region. We will isolate the impact of the KH waves and frontal dynamics on precipitation enhancement by analyzing each region's respective model output precipitation accumulation distributions. Further analysis of the frontal characteristics, thermodynamic environment, and stability parameters will assist with determining if blocking had a role in a potential upstream shift in accumulations.

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Poster Mountain Meteorology Poster Viewing I with Coffee Break

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