Microphysical Measurements during OLYMPEX

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Objectives

• Characterize vertical profiles of cloud microphysical properties near the western Washington coast as a function of geographic location.
• Examine how in-situ measured cloud properties and remote sensed radar properties vary along a sampling transect of stratiform precipitation observed on 1-2 December 2015.

Methods

• During November and December 2015, 20 IOP flight days were conducted during the OLYMPEX field campaign.
• Composite size distributions and bulk microphysical properties (median mass diameter (Dmm), ice water content (IWC) and number of particles with size greater than 125 microns (N125)) were computed from a combination of a vertically oriented two-dimensional stereo (2D-S) probe and a vertically oriented high volume precipitation spectrometer (HVPS-3) aboard the UND Citation.
• Dmm and IWC are consistently greater over land than ocean. This is hypothesized to be a result of additional vertical forcing.
• A Mann-Whitney test showed that for most temperatures, Dmm and IWC are greater over land in a statistically significant manner.

Profiles: Land vs Ocean

Conclusions

• Land – ocean separation of in-situ microphysical data from OLYMPEX show statistically significant differences in Dmm, IWC and N125.
• A case study on 1-2 December 2015 suggests that orographic lifting and additional riming growth of hydrometeors could be causing the differences in the profiles.
• Future work will further distinguish how microphysical properties and size distribution parameters vary with geographic location and meteorological regime.

Case Study Cont.

• As the Citation flies towards the topography, Dmm increases.
• 2D-S particle images show increased supercooled liquid water located closer to topography, hypothesized to be from increased vertical motion.
• The higher supercooled water content leads to larger ice crystals attributed to the riming process.

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