The use of Airborne GNSS RO Profiles in Mesoscale Forecasts of an Atmospheric River Event

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The objective of this study is to test the hypothesis that dense polarimetric GNSS radio occultation (RO) observations can be used to improve numerical simulations of microphysical processes in storms where it can be critical in forecasting heavy precipitation. Atmospheric rivers (ARs) are one such phenomena that is particularly relevant to the western US, where they pose a significant flood hazard and contribute to the Sierran snowpack which is the foundation of the region's water resources. We collected polarimetric GPS measurements, as well as GLONASS occultation observations, from a heavy precipitation atmospheric river event in February 2015 from the National Oceanic and Atmospheric Administration (NOAA) G-IV aircraft during the CALWATER 2015 field Campaign. Quantifying the onshore moisture transport is a crucial factor in determining the amount of precipitation, and dense airborne radio occultation observations are particularly useful for this purpose because of their high vertical resolution over the ocean. We use the Advanced Research Weather Research Forecasting model (ARW-WRF) to simulate the event using the best available reanalyses products and assess the results using available in-situ and remotely sensed observations. These model fields will then be used to provide hydrometeor fields that can be used to estimate the range of expected values of polarimetric delay in the GNSS signals. Finally, the potential impact of the observations on the model are assessed using an Observation System Simulation Experiment (OSSE).