Oceanic Influence on Landfalling Atmospheric Rivers: the Intense Precipitations of February 2-3, 1998

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The landfall of a major extratropical cyclone on February 2-3, 1998 produced an intense precipitation event in the coastal mountains of the western U.S. that led major flooding over northern/central California. The Santa Cruz Mountains saw the most intense precipitations generating a record flooding in the Pescadero watershed. This atmospheric river (AR) event not only developed during the prominent El Niño 1997-98 but also during the California Land-Falling Jets Experiment (CALJET) that recorded the event with aircrafts, boundary layer wind profilers, atmospheric soundings, etc. We use the observations from CALJET to validate the event's simulations with the Weather Research and Forecasting model (WRF) under three different sea surface temperature (SST) boundary conditions (BCs). The SST BC experiments consist on a) a control simulation with the 1998 "observed" SST from a reanalysis product, b) a simulation with the SST of the corresponding dates for the year 2015, and c) a simulation with a coupled 3D Price-Weller-Pinkel ocean model initialized with the same SSTs as the control run.

It has being reported that the oceanic conditions have an influence over extratropical cyclones development, trajectory, strength, and propagation of its cold front and warm sector. In addition, it is also known that the magnitude and direction of the upslope flow, the availability of moisture, latent heat release and ambient thermodynamic stratification, among other factors, have a significant impact on the location and intensity of the precipitations and consequential flooding during ARs. By simulating this winter storm with WRF under different SST BCs, we intend to analyze the ocean effects on these factors. Specifically, we would like to investigate the response of the extratropical cyclone's cold front and warm sector and how this will influence the intensity, location, moisture availability, and landfalling position of the AR low-level jet and its upslope flow.

The WRF model is highly use as a forecasting tool by the U.S. National Weather Service local offices, but with little or none consideration for the oceanic conditions. Therefore, we believe that the results of this research will contribute to understand the ocean's effects on ARs precipitation events and help to improve the accuracy of its forecast.