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CalWater 2 - Precipitation, Aerosols, and Pacific Atmospheric Rivers Experiment

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Emerging research has identified two phenomena that play key roles in the variability of the water supply and the incidence of extreme precipitation events along the West Coast of the United States. These phenomena include the role of (1) atmospheric rivers (ARs) in delivering much of the precipitation associated with major storms along the U.S. West Coast, and (2) aerosols—from local sources as well as those transported from remote continents—and their modulating effects on western U.S. precipitation.

A better understanding of these processes is needed to reduce uncertainties in weather predictions and climate projections of extreme precipitation and its effects, including the provision of beneficial water supply. This presentation summarizes science gaps associated with (1) the evolution and structure of ARs including cloud and precipitation processes and air-sea interaction, and (2) aerosol interaction with ARs and the impact on precipitation, including locally-generated aerosol effects on orographic precipitation along the U.S. West Coast. Observations are proposed for multiple winter seasons as part of a 5-year broad interagency vision referred to as CalWater 2 to address these science gaps (http://esrl.noaa.gov/psd/calwater). In the near term, a science investigation is being planned including a targeted set of aircraft and ship-based measurements and associated evaluation of data in near-shore regions of California and in the eastern Pacific for an intensive observing period between January 2015 and March 2015. DOE's Atmospheric Radiation Measurement (ARM) program and NOAA are coordinating on deployment of airborne and ship-borne facilities for this period in a DOE-sponsored study called ACAPEX (ARM Cloud Aerosol and Precipitation Experiment) to complement CalWater 2.

The motivation for this major study is based on findings that have emerged in the last few years from airborne and ground-based studies including CalWater and NOAA's HydroMeterology Testbed (HMT). The proposed observing strategy would build on these advances and employ airborne, ship-, and ground-based assets together with satellite observations to address the scientific objectives. The approach takes advantage of recent investments in new instrumentation, such as the new sophisticated instrumentation developed at University of California San Diego to measure the chemical composition of nucleated aerosols, and also in observing systems, including HMT, the NASA Global Hawk, and relevant satellite and airborne remote sensing observing systems.