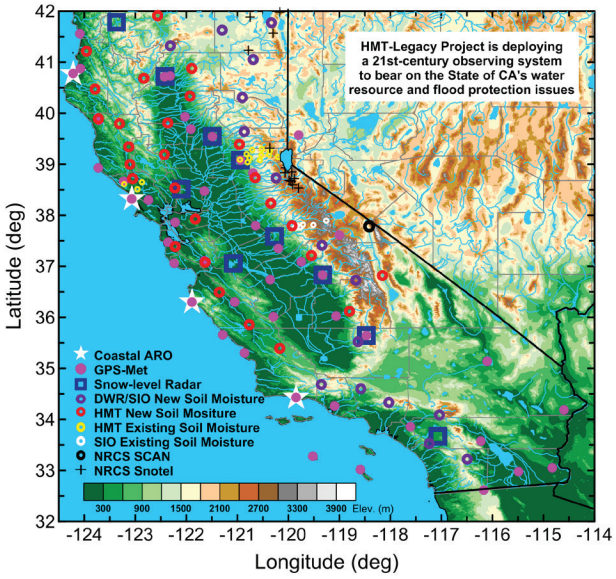
21st Century Observations and Modeling in California

Helping to Address Water Resource and Flood Protection Issues

In 2008, the California Department of Water Resources (CA-DWR) signed a five-year agreement with NOAA's Earth System Research Laboratory (ESRL). The joint project between CA-DWR, ESRL, and the Scripps Institute for Oceanography is part of CA-DWR's **Enhanced Flood Response and Emergency Preparedness (EFREP)** Program. The underlying goal of the joint project is to improve precipitation monitoring and prediction, especially for extreme events. The statewide deployment of observing systems and suite of highy detailed weather forecast models builds on NOAA's Hydrometeorology Testbed (HMT) project carried out in the North Fork of the American River.



The Problem

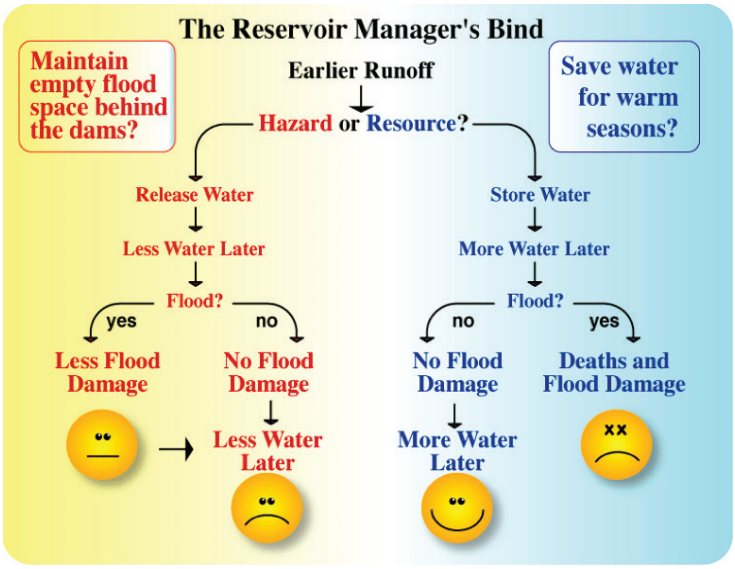
During northern hemisphere winters, the western coast of North America is battered by landfalling storms. The impact of these storms is a paramount concern to California, where water supply and flood protection infrastructure is being challenged by the effects of age, increased standards for urban flood protection, and projected climate change impacts. In addition, there is a built-in conflict between providing flood protection and the other functions of major water storage facilities in California: water supply, water quality, hydropower generation, water temperature and flow for at risk species, and recreation. In order to improve reservoir management and meet the increasing demands on water, improved forecasts of precipitation, especially during extreme weather events, will be required.

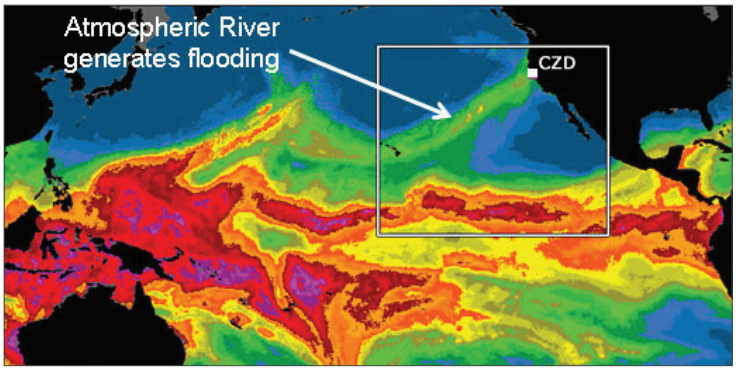
Snow-Level Radar

Soil Moisture Site

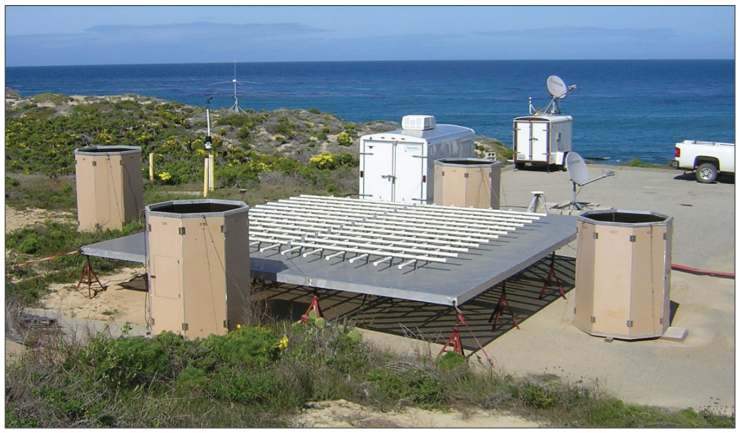
Working Towards a Solution

- Antecedent soil moisture can determine whether a storm produces a flood, so soil moisture sensors with other associated meteorological equipment are being placed at 43 new sites across California.
- Water vapor fuels precipitation, and GPS technology provides a viable method of measuring the vertically integrated water vapor (IWV). HMT is partnering with UNAVCO, the operators of the Plate Boundary Observatory, where many GPS receivers already exist for geodetic purposes, to provide IWV measurements from 45 locations in or near California.
- The snow level is important with respect to flooding in mountainous watersheds because it determines the surface area throughout the watershed that is exposed to snow versus rain. ESRL engineers have invented a new, compact radar designed to measure the snow level at a much reduced cost compared to other radars used for this purpose. These "snow-level radars" are being installed in ten key watersheds across California.
- A major finding from HMT is the role that atmospheric rivers, narrow regions of enhanced water-vapor transport, have in creating heavy precipitation that can lead to flooding. A picket fence of atmospheric river observatories (AROs) is being deployed along the California coast. The AROs provide critical information on water vapor transport aloft and the snow level.
- Taking full advantage of the new measurements requires a complementary effort in data assimilation and weather forecast modeling.
- Decision support tools also are being developed to integrate the new information provided by the observations and models into flood forecasts and water management decisions.





Satellite Image of an Atmosperic River



Atmospheric River Observatory

On the Web:

Hydrometeorology Testbed: hmt.noaa.gov
Atmospheric Rivers: www.esrl.noaa.gov/psd/atmrivers/
Real-time & Archived Data: www.esrl.noaa.gov/psd/data/obs/

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