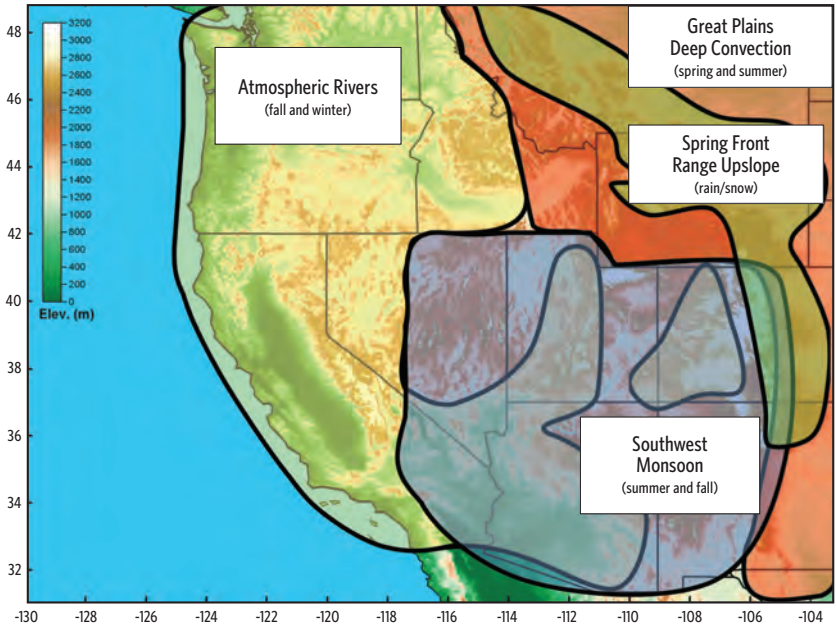
21ST CENTURY

Western Observing System for Extreme Precipitation

The Western States Water Council supports developing an improved observing system for extreme precipitation events in the West (position #332, adopted June 2011). A better ability to forecast the timing and amount of precipitation expected from major storms will benefit state flood management, emergency response, and traffic operations programs, as well as state, federal, and local reservoir managers and coastal resources managers. Recognizing the importance of preparing for climate extremes, the Western Governors' Association and the National Oceanic and Atmospheric Administration (NOAA) signed a memorandum of understanding in 2011 which called for undertaking projects to help reduce disaster risks associated with extreme events.

At the request of the Council and the California Department of Water Resources (CDWR), NOAA's Hydrometeorology Test Bed (HMT) program worked with the research community to develop a vision for a proposed 21st century Western observing

Regional variation in sources of Western extreme precipitation. *NOAA figure*



system for extreme precipitation. The observing system is based on experience gained in California, where the HMT program has partnered with other federal agencies, local agencies, and CDWR for almost 10 years to carry out field research and monitoring of winter storms. The HMT project's success in California and recent CDWR/NOAA efforts to permanently install HMT monitoring technologies prompted the Council's interest in expansion of these monitoring capabilities more broadly in the West.

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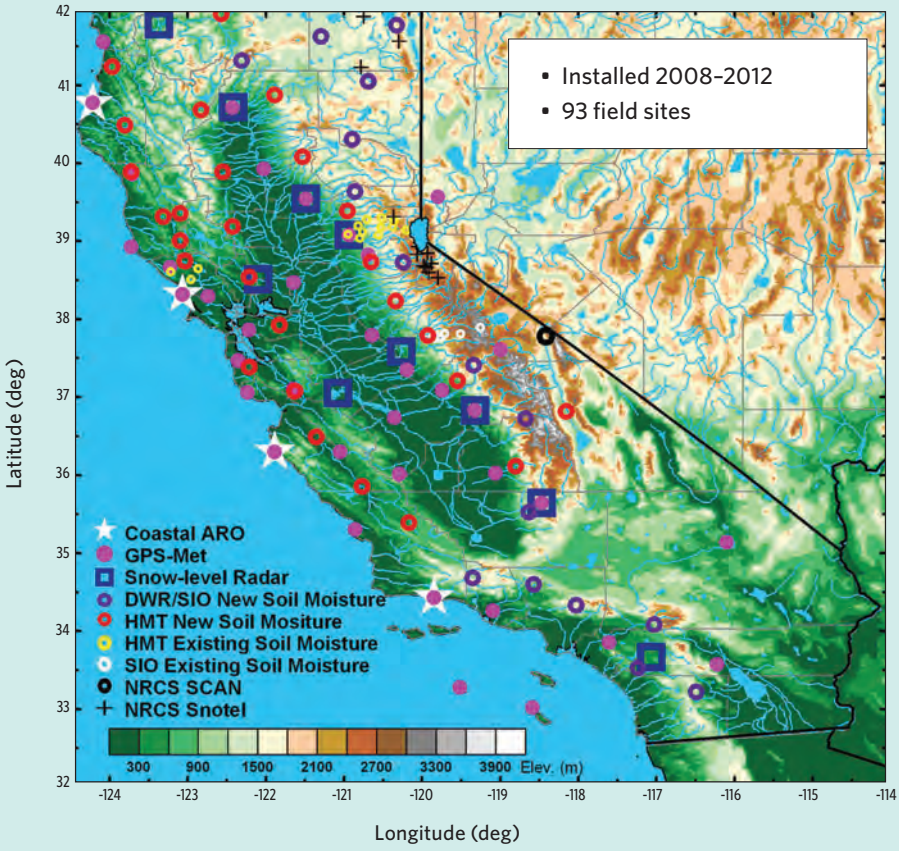
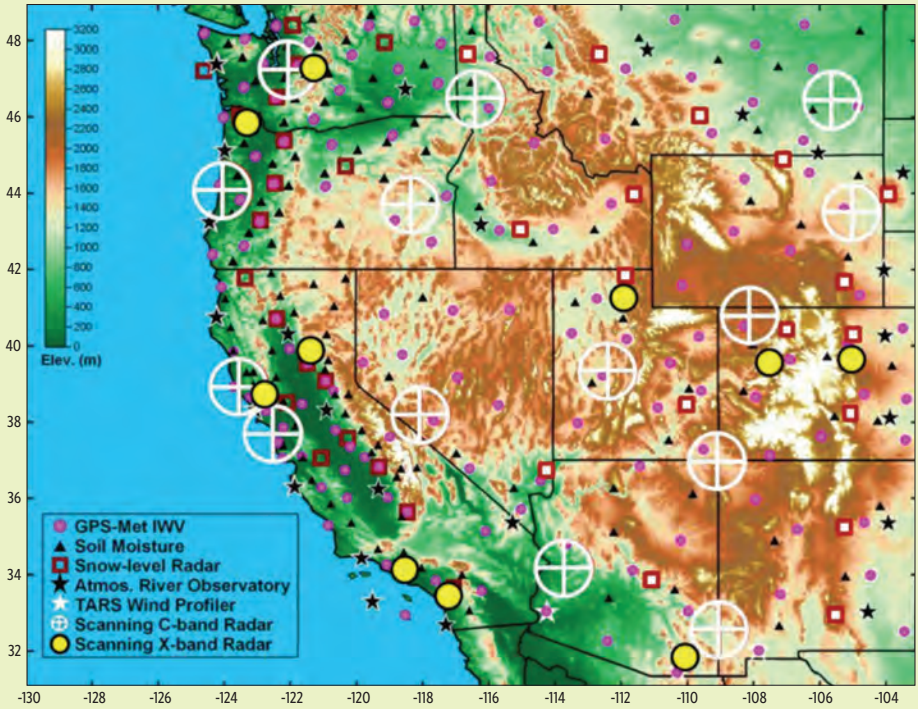
Examples of Existing and Potential Instrumentation



An AR-focused long-term observing network is being installed in California as part of a 5-year project between CDWR, NOAA and Scripps Inst. of Oceanography.
NOAA figure



Schematic network of new land-based sensors to improve monitoring, prediction and climate trend detection for hydrometeorological conditions that create extreme precipitation and flooding. Offshore coastal sensors not shown.

NOAA figure.

The HMT project in California identified a major gap in existing hydrometeorological monitoring and precipitation forecasting — our limited ability to track and quantify water vapor transport from the Pacific Ocean across the West's mountainous terrain. Existing meteorological observations do not measure winds and water vapor far up enough into the atmosphere. Using new methodologies and technologies that have largely only become available in the past decade, the envisioned 21st century observing system would fill this gap and augment or complement existing monitoring networks already in place.

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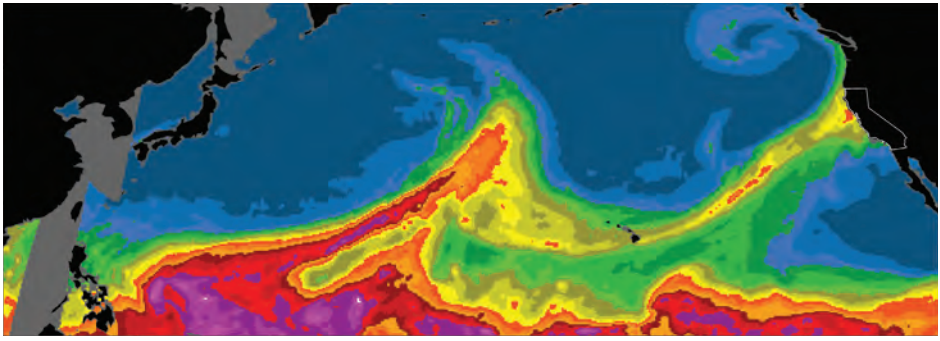

Satellite image of atmospheric river reaching West Coast. Atmospheric river storms — storms fueled by concentrated streams of water vapor from the Pacific Ocean — are responsible for most episodes of major West Coast flooding. The HMT's efforts in California were responsible for identifying this storm type and its importance for flood management and water supplies.
NOAA figure

The envisioned Western observing system will require research and the development and installation of instrumentation to improve real-time tracking of hydrometeorological conditions, forecast lead times, and quantitative precipitation estimates for major storms in the West. Examples of needed instrumentation include atmospheric river observatories with specialized radars and other meteorological instrumentation such as wind profilers and water vapor monitors, together with precipitation, streamgage, and soil moisture networks and new types of snow instrumentation. Examples of needed research include developing offshore monitoring systems (e.g., buoy-mounted systems) to provide early warning and forecasting capabilities for major storms hitting the West Coast. The network design and combinations of instrumentation would vary from place to place as needed for observing specific storm types responsible for causing extreme precipitation in different areas of the West. West-wide installation of the observing system is estimated to cost in the range of $200 million over six years.

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western states
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