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NOAA, California partner to improve forecasts of powerful "atmospheric river" winter storms

NOAA scientists and colleagues are installing the first of four long-term "atmospheric river observatories" in coastal California this month to better monitor and predict the impacts of landfalling atmospheric rivers. These powerful winter systems, sometimes called "pineapple express" storms, can be beneficial, in that they help to fill the state's reservoirs, but they can also cause destructive floods and debris flows.

The coastal observatories, which are arrays of custom instruments, are being installed in collaboration with the California Department of Water Resources and Scripps Institution of Oceanography, University of California San Diego. The observatories will give weather forecasters, emergency managers and water resource experts detailed information about incoming storms such as winds and water content.

"California needs to know how and where it might rain or snow, when and where to expect flooding," said Michael Anderson, Ph.D., state climatologist with the California Department of Water Resources. "The observatories will also help state officials and scientists monitor changes in atmospheric rivers associated with climate change."

This month's installation of an atmospheric river observatory in Bodega Bay, Calif., will be followed by installations at Eureka, Point Sur and Goleta. The move to set up the four observatories and other weather instruments throughout the state came after NOAA researchers and academic scientists spent several winters testing and selecting the most effective arrays of instruments for collecting useful information for decision makers. Installation of all four observatories is expected to be completed by early 2014.

"With satellites, we can see the tell-tale water vapor signature of an incoming atmospheric river over the ocean. However, NOAA's offshore observing systems do not measure another key factor—strong low-altitude winds," said Martin Ralph, Ph.D., a research meteorologist and branch chief in NOAA's Earth System Research Laboratory in Boulder, Colo. "With our new sensors, we'll be able to measure those winds and more, to understand just how much moisture is moving in, which largely controls how extreme the precipitation inland will become. This information will ensure that meteorologists and emergency managers have additional information to keep the public informed about these potentially destructive storms."

The four coastal observatories will include:

- A Doppler wind profiling radar, which reveals the speed and direction of winds at several altitudes aloft;
- A technique for extracting critical information from wind profiler data—the level in the atmosphere where falling snow turns to rain;
- Global positioning system (GPS) water vapor instruments, which measure the total amount of water vapor above the site; and
- Standard meteorological instruments (relative humidity, temperature, pressure, rain gauge).

Combined, these data allow forecasters to monitor the transport of moisture into the state, which is critical in determining precipitation amounts and locations as well as the altitudes in the mountains that will receive rain as opposed to snow.

These observatories will become part of the statewide observing network designed by NOAA scientists and colleagues to give forecasters and water managers the information they need to help to mitigate the impacts of strong atmospheric rivers, such as extreme precipitation and flooding. For example, snow-level radars designed, built and tested by NOAA scientists, are now deployed in 10 major watersheds across the state. Also, a network of soil moisture sensors is being installed at 43 sites across the state, including several in the flood-prone Russian River watershed.

“These soil moisture sensors are key to anticipating whether an incoming storm will produce heavy runoff or if much of the rain will be absorbed in the soil,” said Michael Dettinger, a research hydrologist with the U.S. Geological Survey and a research associate with Scripps.

“This new and innovative network, transitioning research into operations, is helping California move into the future, better observing and planning for floods and water resource issues of today and tomorrow,” Anderson said.

NOAA’s mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Join us on Facebook, Twitter and our other social media channels.

The California Department of Water Resources operates and maintains the State Water Project, provides dam safety and flood control and inspection services, assists local water districts in water management and water conservation planning, and plans for future statewide water needs.

Scripps Institution of Oceanography is one of the oldest, largest and most important centers for global science research and education in the world. Now in its second century of discovery, the scientific scope of the institution has grown to include biological, physical, chemical, geological, geophysical and atmospheric studies of the earth as a system.

On the Web:
NOAA: http://www.noaa.gov
NOAA Hydrometeorology Testbed: http://hmt.noaa.gov/
California Department of Water Resources: http://wwwdwr.water.ca.gov/#
Scripps Institution of Oceanography: http://sio.ucsd.edu/

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