

Hydrometeorology Testbed

Extreme Precipitation

A recent study indicates that 70% of Americans feel that precipitation forecasts are critically important to their daily livelihood. Yet forecasting precipitation remains a major challenge, especially for the extreme events. Flash floods and longer-term flooding events are among the leading natural causes of the loss of life and property, accounting for the largest share of Presidential disaster declarations in any given year. Furthermore, extremes leading to scenarios of too much or too little water, or even both, challenge water management efforts to balance the needs of flood protection; storage for domestic, industrial, and agricultural consumption; recreation; and the maintenance of healthy ecosystems. The NOAA Hydrometeorology Testbed (HMT) is aimed at improving precipitation and streamflow forecasts to allow water managers to achieve this balance.



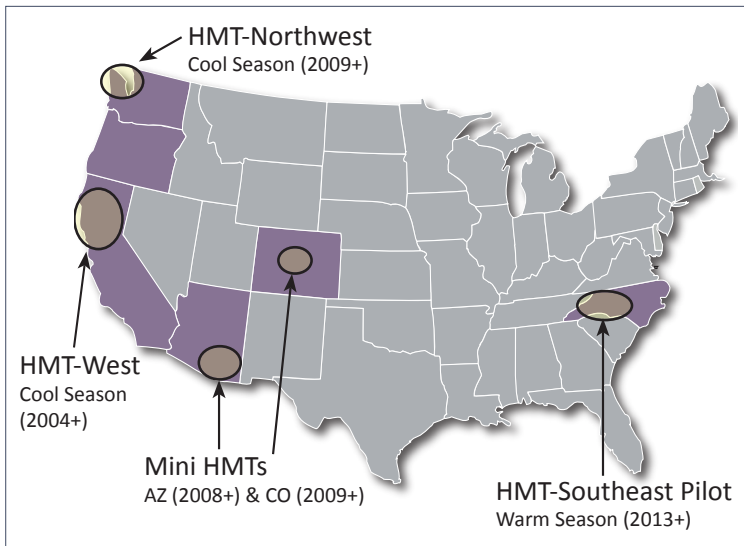
Flooding in North Carolina (FEMA photo)

For more information, contact:

Allen White
 NOAA/ESRL
 Physical Sciences Division
 Boulder, CO
 Email: Allen.White@noaa.gov
 Phone: 303.497.5155

About HMT

Guided both by NOAA service requirements, stakeholder needs, and emerging scientific questions and new technologies, HMT directly engages decision makers and scientists in research and development processes. New ideas, technologies and predictive models are developed, demonstrated, evaluated and refined through the testbed, and are transitioned to forecast operations/applications.



HMT’s activities are focused on the causes of extreme precipitation and the attendant flooding, including:

- Monitoring precipitation (quantitative precipitation estimates)
- Predicting precipitation (quantitative precipitation forecasts)
- Determining the type of precipitation (rain or snow)
- Coupling the precipitation falling from the sky to the impacts on the ground: snow pack, soil moisture, runoff; flooding, and mudslides
- Developing decision support aids: providing not just more information to the front line forecasters, but smarter tools for effective decision making
- Verification: building credibility in the new products and services related to precipitation

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Current Activities

HMT originated from studies of winter storms hitting the west coast of the U.S. – storms with intensity and impacts rivaling that of hurricanes on the East Coast. The year 2005 saw the first full implementation of the NOAA HMT on the West Coast. The testbed has since grown and evolved, and HMT is poised to establish new regional testbeds. HMT's current and ongoing activities include:

HMT-WEST

HMT-West uncovered the major role that intense moisture-bearing winter storms, called atmospheric rivers (ARs), play in producing extreme precipitation and flooding. Given this paradigm and the uncertainty of how ARs would change in intensity or frequency in a changing climate, the State of California funded HMT to implement a 21st-century solution to help the state deal with its water resource and flood protection issues. The solution includes a more than 100-station network of state-of-the-art atmospheric and ground sensors that measure the key variables that cause extreme precipitation and flooding. Special web-based display products that take advantage of these unique observations to evaluate the skill of operational weather forecast models are made available to the Weather Forecast Offices, River Forecast Centers, and the general public. Decision support tools, that will allow water managers and other decision makers to make optimal use of the information, are being developed.

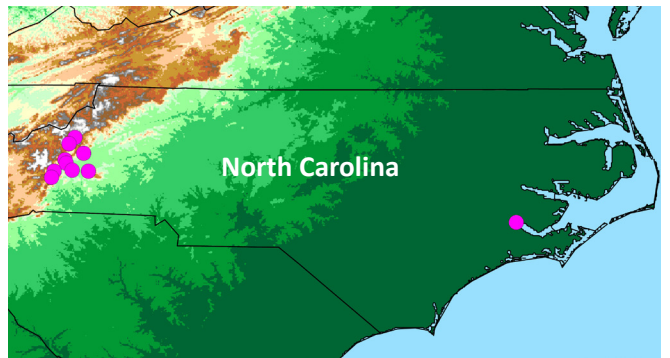
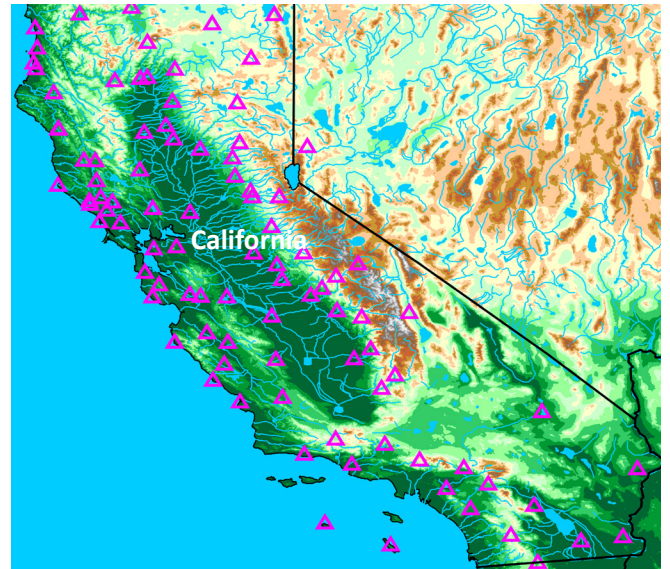
The HMT-West observing network is also the framework from which the State of California, NOAA, and their partners are exploring the linkages between ARs, aerosols, and precipitation through the CalWater Program: an effort aimed at understanding natural- and human-induced changes to the climate that will impact long-term water supplies, droughts, and floods.

HMT-SOUTHEAST PILOT STUDY

The second regional implementation of HMT was in North Carolina. The Southeastern U.S. faces unique hydrometeorological challenges from winter storms, summer convection, and land-falling tropical storms, including intense hurricanes. Similar to HMT-West, HMT-SE began as a pilot project, building on assets provided by partners at NOAA, NASA, and the academic community. The HMT-Southeast is being supplemented with additional observations through funding made available by the Sandy Supplemental appropriations.

HMT Outcomes

- Improved scientific knowledge and understanding of conditions that create extreme precipitation.
- Improved assessment of current conditions and forecasts, leading to improved situational awareness of extreme precipitation events.
- Improved weather and water information that allows for more efficient management and use of water resources to balance numerous and often-competing interests.
- New observations to support long-term monitoring of our changing climate.
- Demonstration of regional testbeds as conduits to infuse new science and technology into operations.
- Increased protection of lives and property through improved forecasts of hazardous weather.



(Top) HMT-West field sites in California, (Bottom) HMT-Southeast Pilot Study field sites in North Carolina



Instruments at an HMT field site in Chico, California including a wind profiler and meteorological tower. (Credit: Clark King, NOAA)