Hydrometeorology Testbed

Tools for Water in a Changing Climate

NOAA's Hydrometeorology Testbed (HMT) conducts research on precipitation and weather conditions that can lead to flooding, and fosters transition of scientific advances and new tools into forecasting operations. HMT's outputs support efforts to balance water resource demands and flood control in a changing climate.

Why 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 the extreme events. Indeed, the NOAA Research Council identified "improvement in our ability to forecast weather, climate, water resources and ecosystem health" as one of the 7 grand science challenges for the next 5-20 years.

In one season alone in California, only 2 of the 16 extreme precipitation events were correctly predicted with 24-h lead time. 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.

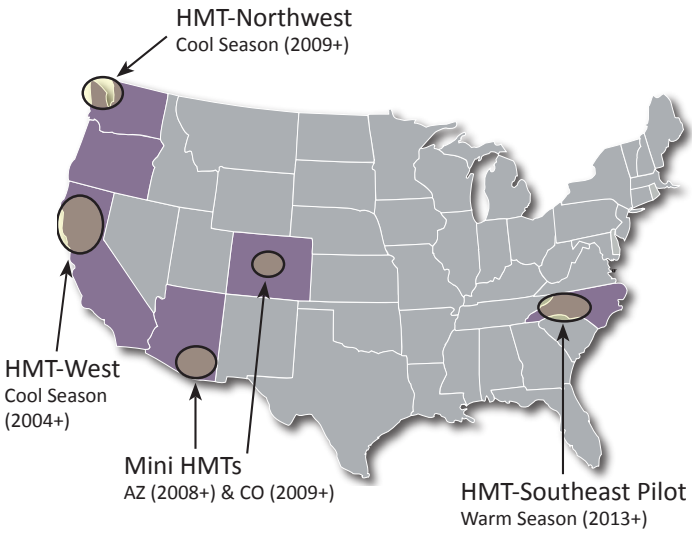
Global climate change is expected to contribute to greater weather extremes, leading to scenarios of too much water or too little water or even both. This will further exacerbate the challenges of water resource management, which is aimed at balancing the needs of flood protection, and storage for domestic, industrial and agricultural consumption, recreation and the maintenance of healthy ecosystems. This balance is predicated upon access to accurate precipitation forecasts. HMT is aimed at improving forecasts to allow water managers to achieve this balance.

What is HMT?

Guided by NWS operational requirements and by emerging scientific questions and new technologies, HMT directly engages the forecasters and scientists in the research and development process. New ideas, technologies and predictive models are developed, demonstrated, evaluated and refined through the testbed, and some are then transitioned to operations.

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 & debris flow
- 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



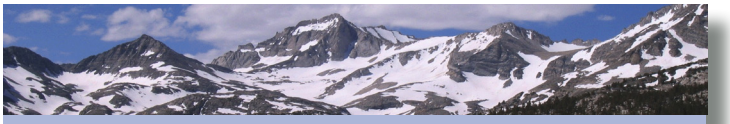
Preparing for the Future

What's Next?

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. It was recognized that for this research to have an enduring operational impact, a new way of conducting research was required. 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 plans for the next five years include:

HMT-West: The Sacramento area is considered to be among the nation's most at risk regions where a catastrophic flood could occur. Building on a ten-year effort in California, HMT-West uncovered the major role that atmospheric rivers (ARs) play in producing extreme precipitation and flooding. As storms travel across the Pacific, they sometimes tap into tropical moisture creating long ribbons of moist air know as ARs. When this happens, an otherwise innocuous storm can turn deadly. HMT has developed tools to help forecasters predict the impact of ARs on coastal communities, and has conducted training of NWS staff. HMT–West will conduct intensive field studies and demonstrations in Northern California and elsewhere in the western U.S. to improve understanding of extreme precipitation and creating valuable records of climate variability.

Long-term, HMT-West will continue to foster transition of relevant research to weather and climate services. In partnership with the State of California, HMT is implementing key monitoring and forecast capabilities through the Enhanced Flood Response and Emergency Preparedness Program. The HMT-West network is also the framework from which the State of California and NOAA are exploring the linkages between atmospheric rivers, aerosols, and precipitation through the CalWater Program: an effort aimed at understanding human induced changes to the climate and affects on long-term water supplies and flooding.



Water and a Changing Climate...

"Within the United States, extensive climate-related changes have been documented over the last century. These include increases in continental-average temperatures, rising sea levels in many coastal locations, an increased frequency of extreme heavy rainfall events, lengthening of the growing season, earlier snowmelt, and altered river flow volumes. Water is an issue in every region, but the nature of the potential impact varies. Drought is a serious problem in many regions, especially in the West and Southeast; and floods and water quality problems are likely to be amplified by climate change in most regions."

– Dr. Jane Lubchenco, NOAA Administrator

Flooding in Greenville, NC from the Tar River caused by Hurricane Floyd in September of 1999. Photo by Dave Saville, FEMA News.

HMT-Southeast: Planning is now underway for HMT-Southeast (HMT-SE), projected to begin ramping up in 2013 in North Carolina. The Southeastern U.S. faces unique hydrometeorological challenges from winter storms, summer convection and land-falling tropical storms and hurricanes. Similar to HMT-West, HMT-SE will begin as a pilot project, building on assets provided by partners at NOAA, NASA, and the academic community.

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.
- New observations to support long-term monitoring of our changing climate.
- Improved weather and water information that allows for more efficient management and use of water resources to balance numerous and often-competing interests.
- 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.

hmt.noaa.gov

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