NOAA Hydrometeorology Testbed

HMT-West 2010 Operations

Participants

- NOAA Earth System Research Laboratory
  (Physical Sciences Division and Global Systems Division)
- NOAA National Severe Storms Laboratory
- NOAA Office of Hydrologic Development
- NOAA National Centers for Environmental Prediction
- NOAA National Weather Service - Western Region
  - WFO's Sacramento, Reno, Monterey, Eureka
  - NOAA California-Nevada River Forecast Center
  - Regional Headquarters
- CIRES - University of Colorado
- CIRA - Colorado State University
- CIMMS - University of Oklahoma
- California Department of Water Resources
- Scripps Institute
- U.S. Geological Survey
- University of Washington
- Developmental Testbed Center
- Western Regional Climate Center

Background

NOAA's Hydrometeorology Testbed (HMT) is a demonstration program that focuses the use of advanced observational and modeling tools on quantitative precipitation estimation (QPE) and quantitative precipitation forecasting (QPF) for the purpose of improving hydrologic forecasts and warnings. The testbed approach will accelerate transitions from the research and development community to operations, as described in NOAA's Strategic Plan and recommended by the NOAA Hydrology Team's Science and Technology Infusion Plan (STIP) and the U.S. Weather Research Program (USWRP).

The first four full-scale deployments of HMT occurred during the winters of 2005-2006 (HMT-West 2006), 2006-2007 (HMT-West 2007), 2007-2008 (HMT-West 2008) and 2008-2009 (HMT-West 2009) and were focused on the North Fork of the American River Basin located between Sacramento and Reno on the western slopes of the Sierra Nevada. Water from the American River Basin is a critical resource for California's economy and natural ecosystems, and the threat of flooding poses an extremely serious concern for the heavily populated downstream area (Figure 1). The frequent impact of prolonged, heavy winter precipitation from concentrated "atmospheric rivers" of moisture, originating in the tropical Pacific, underscores the area's flood vulnerability.

HMT-West 2010 Field Operations

Field operations will return to the American River Basin area during the winter of 2009-2010 for HMT-West 2010. Figure 2 shows the locations of instruments to be deployed for this effort. Most will operate from December 2009 through March 2010. A wide range of remote and in situ sensors will be deployed to accomplish this task. Remote sensing instrumentation includes a scanning Doppler radar, several wind profiling and precipitation profiling radars and a network of GPS receivers for measuring precipitable water vapor. Precipitation gauges and disdrometers, surface meteorological stations, soil moisture/temperature probes, snow depth sensors and stream level loggers are among the in situ sensors that will be deployed. In addition, rawinsondes will be released serially immediately upwind of the area during storm episodes. These special, highly detailed observations will be collected within the wider scale context of the operational observing.
networks of the National Weather Service (NWS) and other agencies (Figure 3).

A special aspect of HMT-West 2010 will be its complementary interaction with the CalWater project sponsored by the California Energy Commission. The overarching objective of CalWater is to better understand how aerosols and atmospheric rivers are impacting the precipitation and snowpack variability in California. CalWater will benefit from the existing HMT-West field network and several new field sites deployed in support of CalWater will benefit HMT-West. Table 1 provides a comprehensive list of all the instrumentation that is associated with HMT-West 2010.

Data from HMT and operational sources will be merged in algorithms with the intent to produce multi-sensor (e.g., radar + gauge) estimates of precipitation. These blended estimates overcome deficiencies inherent in estimates based on single instrument types. Equally important, demonstrations and evaluations of precipitation forecast improvements will be conducted for the American River Basin using high-resolution numerical prediction models, now in use as research tools.

In addition to the ongoing evaluation of the practical usefulness of the various new observing and model tools, specific HMT-West 2010 research objectives include:

- Attaining accurate QPE over the basin with high spatial resolution.
- Demonstrate new high-resolution forecast models and model ensembles for QPF tailored to the HMT area.
- Accurately mapping the height of the melting layer and monitoring its evolution.
- Improving understanding of the Sierra Nevada barrier jet, how it influences precipitation distribution and how it is influenced by atmospheric rivers.
- Test and evaluate different in situ precipitation measurement devices for use in future HMT efforts that will encounter mixed-phase precipitation.
- Demonstrate the concept of a regional HMT as a conduit to infuse new science and technology into operations.