NOAA National Severe Storms Laboratory
# MRMS Multiple Radar/Multiple Sensor

A new system developed by NSSL and recently activated by NOAA's National Weather Service (NWS), quickly harnesses the tremendous amount of weather data from multiple sources, intelligently integrates the information, and provides a detailed picture of the current weather. MRMS will improve the ability of forecasters to issue public warnings and advisories for severe weather such as tornadoes, hail and flash floods, and will help improve forecasts for safety of air traffic.
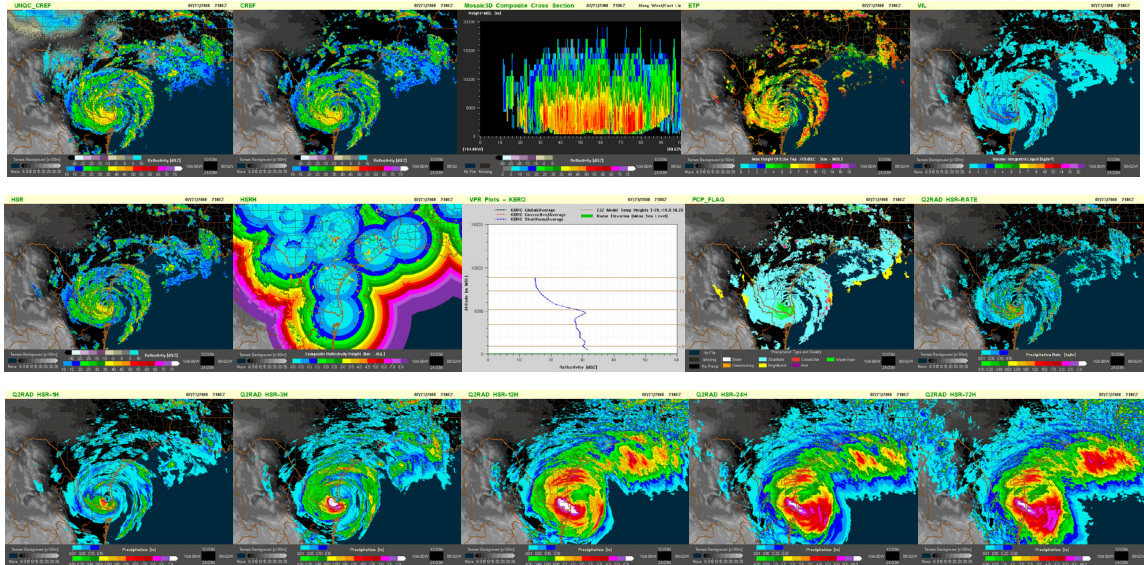
MRMS produces and issues a suite of more than 100 high resolution products over North American on a 1-km grid every 2 to 5 minutes. These data are used in weather forecast models, and for severe weather, aviation, and hydrometeorology forecasts.

Improving forecasts

The Multiple Radar Multiple Sensor (MRMS) system combines data streams from multiple radars, satellites, surface observations, upper air observations, lightning reports, rain gauges and numerical weather prediction models to produce a suite of decision-support products every two minutes. Because it provides better depictions of high-impact weather events such as heavy rain, snow, hail, tornadoes, and other threats, forecasters can quickly diagnose severe weather and issue more accurate and earlier forecasts and warnings.

Research to operations success story

Researchers at NOAA's National Severe Storms Laboratory designed the MRMS system to improve decision making within NOAA and other agencies - marking another NOAA research to operations success. Implementation of the system into NWS operations was funded in part by the Disaster Relief Appropriations Act of 2013.

MRMS is being deployed operationally to the NWS, with completion by the end of 2016. A duplicate MRMS will be at NSSL to ensure new MRMS capabilities will be rapidly transitioned into NWS operations.
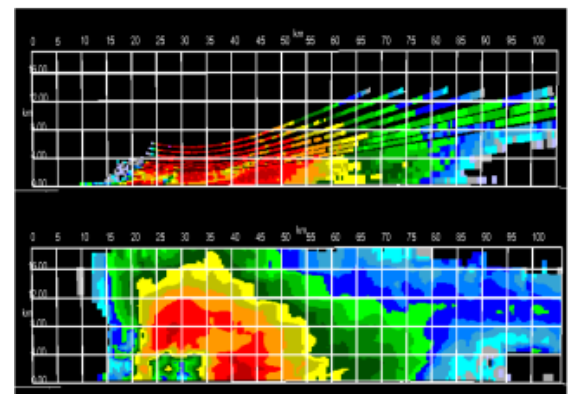
By combining data from adjacent radars, the Multi-Radar Multi-Sensor system gives forecasters a more detailed picture of a thunderstorm's intensity. The top image is data from a single radar compared with data from the Multiple Radar system in the bottom image. and hydrometeorology forecasts.

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MRMS QPE

MRMS Quantitative Precipitation Estimation (QPE) uses the most advanced polarimetric radar technologies and provides high-resolution information about precipitation types and amounts for the nation. More than 70 government agencies, universities, and private companies use the products for flash flood and river flood warnings and water resources management.

MRMS FLASH

NSSL's Flooded Locations and Simulated Hydrographs (FLASH) project uses rainfall data from MRMS as input into a hydrologic model to produce flash-flooding forecasts up to 6 hours in advance with a 5-minute update cycle. FLASH yields seamless forecasts across the U.S. FLASH was evaluated for the first time in the Hazardous Weather Testbed - Hydro project where forecasters used the new guidance to issue experimental flash flood watches and warnings.
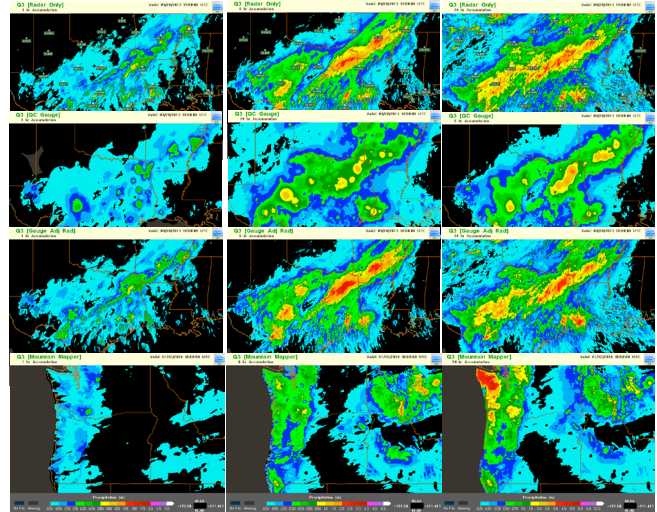
CI-FLOW

NSSL is a major partner in the Coastal and Inland FLooding Observation and Warning (CI-FLOW) research project that uses MRMS data to explore how coastal flooding forecasts might be improved through the coupling of streamflow and storm surge models. A demonstration project over the Tar-Pamlico and Neuse River basins in North Carolina showed excellent value in having MRMS rainfall estimates fed into a model that predicts which coastal streams and rivers will flood.

Ongoing research

MRMS data are an input into the newly operational powerful High-Resolution Rapid Refresh (HRRR) weather model, which will improve the quality of forecasts and warnings for severe weather events. MRMS is also being used to develop and test new Federal Aviation Administration (FAA) NextGen products in addition to advancing techniques in quality control, icing detection, and turbulence in collaboration with the National Center for Atmospheric Research, the University Corporation for Atmospheric Research, and Lincoln Laboratories.

NSSL researchers plan to continue their collaboration with NOAA partners such as developers, trainers and forecasters to collect best practices and case studies. The system is designed so that new techniques and products can be added, increasing its capabilities.

1, 3, 6, 12, 24, 48 and 72 hr accumulations

MRMS produces more accurate estimates of precipitation accumulation.
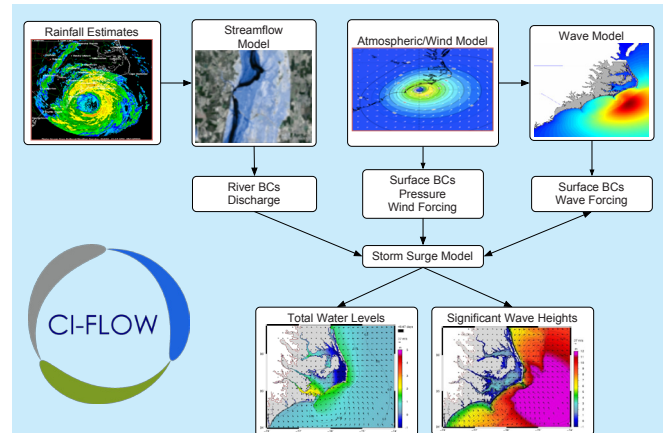
The CI-FLOW demonstration project predits the combined effects of coastal and inland floods for coastal North Carolina.

The MRMS system was jointly developed in cooperation with the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS), and the University of Oklahoma retains the right to commercially license the software. Several leading weather information companies have previously licensed the MRMS system from the University of Oklahoma for commercial use, although the software is available for government at no cost.