

NOAA Knows...

Hurricane Forecasting

Hurricanes are one of nature's most powerful forces. Powerful winds and storm surge can put millions at risk. Even after landfall, hurricanes and tropical storms can produce tornadoes and deadly inland flooding. NOAA is the federal agency charged with forecasting these potentially deadly storms to help protect lives and livelihoods.

Observing and Tracking

The forecast process begins with data. Geostationary (GOES) satellites over the Atlantic and Pacific oceans can detect developing storms' first clusters of showers and thunderstorms, and continuously observe the storms from their formation to dissipation. Because GOES data are always available, these satellites are the single most important source of information for hurricane tracking.

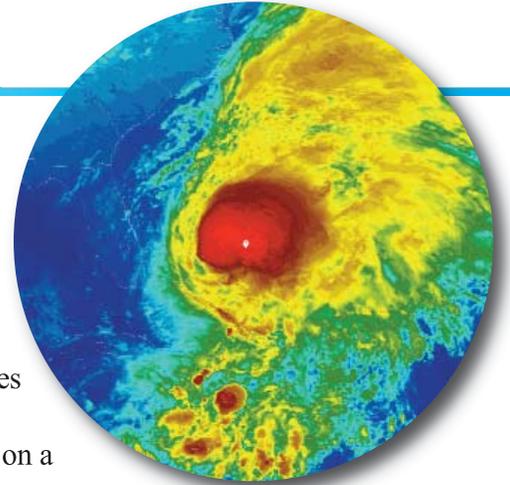
NOAA's polar orbiting satellites (POES) fly over the storm twice a day at a lower altitude, carrying microwave instruments that provide information on storm structure. Microwave data from NOAA and NASA satellites are like radars in space, revealing the structure of rainbands often hidden beneath a hurricane's high clouds.

Once a hurricane becomes a threat to land, U.S. Air Force and NOAA hurricane hunter aircraft are dispatched to take detailed observations from in and around the storm – observations that cannot be obtained remotely from satellites.



NOAA hurricane hunter WP-3D Orion and Gulfstream IV aircraft in flight.

Flying through the eye of the storm, these aircraft can determine the precise location and movement of the hurricane. Dropsondes (tubes of weather instruments that fall on a parachute) and microwave sensors measure the storm's intensity.



NOAA's G-IV jet releases dropsondes to measure the steering currents surrounding the hurricane, improving forecasts of the hurricane's track. The NOAA planes also have Doppler radars that reveal the three-dimensional wind structure of the storm.

Additional data are provided by international weather stations, ocean-going ships, and hurricane buoys run by NOAA and other organizations. As storms make landfall, NOAA's network of coastal Doppler radars provide critical data in those last hours.

Numerical Models

Forecasters analyze various numerical models to predict the path of a hurricane. Every six hours, forecasters sift through new model runs from NOAA, the Defense Department, international weather centers, and even universities and private companies. Based on their experience with each model and the particular dynamics of a storm, NOAA forecasters weigh the output of the models and prepare a forecast of the storm's path and intensity for the next five days.

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Forecaster Expertise

Hurricane models may run on supercomputers, but human expertise is just as important in the crafting of a hurricane forecast. The Hurricane Specialists at the National Hurricane Center have decades of experience analyzing these models – experience that is crucial when the models give a wide range of possible solutions.

NHC forecasters confer with scientists onboard the hurricane hunter aircraft, and consult with NOAA meteorologists and international meteorologists in weather forecast offices in the storm’s path who are busy analyzing their local conditions.

Forecasters also brief emergency management officials to help them make the best possible decisions to keep their communities safe. A FEMA office inside the hurricane center itself acts as a vital communications link between forecasters and emergency managers.



L to R: Jack Beven, James Franklin, Bill Read, and (seated in back) Christopher Landsea discuss Hurricane Bill forecast, August 2009.

Communicating Forecasts to the Public

Even before a tropical cyclone forms, graphical and text-based forecast products on developing disturbances are available to the public on the Web and are also communicated by broadcast meteorologists.



NOAA GOES-R satellite.

Once a storm forms, a complete suite of advisory products is issued by the NHC every six hours. NOAA Weather Radio provides constant updates. Once a storm is within 36 to 48 hours of landfall, the National Hurricane Center goes into high gear to communicate its forecasts to the public.

Television and radio networks swarm to the NHC for what’s known as “pool coverage.” The NHC Director and Deputy Director relay the forecasts and warnings to millions of viewers and listeners through near constant interviews – one every five minutes for up to 20 hours at a stretch. During a landfalling storm, NOAA Web sites may receive hundreds of millions of hits, providing critical information to those in harm’s way.

To learn more about hurricane forecasting, visit NOAA’s Hurricane Center Web site at <http://www.hurricanes.gov/>.

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