HURRICANE FORECASTING

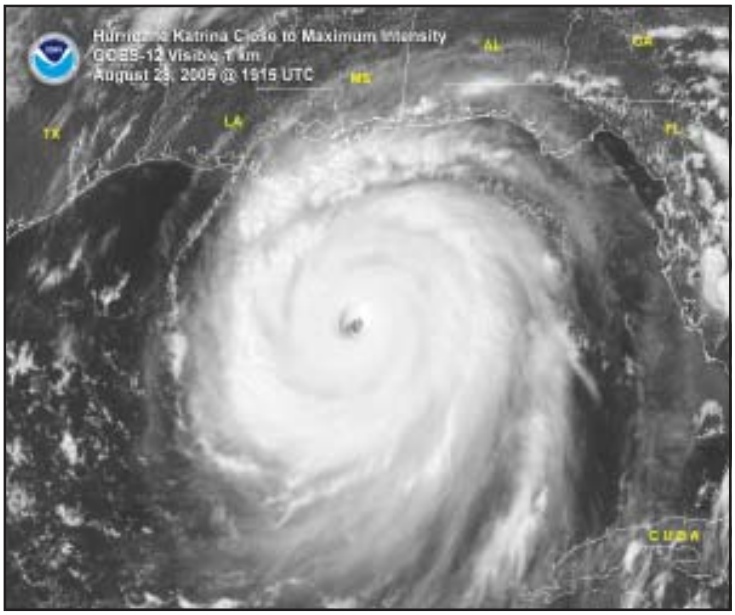
Hurricanes are one of nature's most powerful forces. Powerful winds and storm surge can put millions at risk. Even after landfall, hurricanes and tropical storms can produce tornadoes and deadly inland flooding. NOAA is the federal agency charged with forecastng these potentially deadly storms to help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

National Hurricane Center forecasters use many tools to make their forecasts accurate.

Observing and Tracking

The first part of making a forecast is seeing a storm developing and then getting inside it to collect data. Geostationary east and west satellites first see the convective factors of a storm brewing, sometimes as early as a small cluster of showers and thunderstorms soon after they form off the west coast of Africa. This satellite stays with the storm from beginning to end. It's the workhorse of the satellites and arguably the most important data are collected by the GOES.

NOAA's polar orbiting satellite (POES) flies over the storm twice a day at a lower altitude, loaded with microwave instruments that provide massive amounts of data, all the way to the ocean's surface. Forecasters also take data from two instruments on NASA satellites – the Tropical Rain Measurement Mission (TRMM) instrument and QuikSCAT instrument. Forecasters receive data about storm structure, including rain, wind speed and direction.



GOES-12 satellite sees Hurricane Katrina approaching the Gulf Coast.

But even more important to analyzing a landfalling hurricane are the data collected by the U.S. Air Force and NOAA hurricane hunter aircraft flying through the eye of the storm and NOAA's G-IV jet flying around it. The planes have Doppler radar and microwave technology to dissect the storm, and the dropsondes (tubes of weather instruments attached to a parachute) released from the aircraft send back critical data as they float down to the ocean. Forecasters also use data provided by NOAA's network of coastal Doppler radars, ocean going ships, international stations, and NOAA's series of hurricane buoys tethered in hurricane prone zones.

Numerical Models

Forecasters analyze various numerical models to predict the path of a hurricane. Four times a day, forecasters sift through new model runs from NOAA, the Defense Department, European weather centers, 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. This adds to the challenge of

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predicting a storm's path five days before landfall – especially when the track of each model can vary by hundreds of miles.

Forecaster Expertise

Human expertise is just as important to a forecast as supercomputers. NOAA's hurricane forecasters have decades of experience analyzing operational models. They confer with scientists onboard hurricane hunters, and consult with NOAA meteorologists and international meteorologists in weather forecast offices in the storm's path who are busy analyzing their local conditions and communicating with emergency management officials.

Communicating Forecasts to the Public

From before a tropical cyclone forms, graphical and written forecast products on the storm are available to the public on the Web and are also communicated by broadcast meteorologists. NOAA Weather Radio provides constant updates.

NHC forecasters spread their warnings and forecast to the public through the broadcast news media–local, national, and international–from their headquaters in Miami, as well as through its Web site, one of the most visited on the Internet.

Thirty-six to 48 hours before predicted landfall the National Hurricane Center goes into high gear to communicate its forecasts to the public via broadcast outlets. NOAA calls in all the television and radio networks and the Miami media for what's known as "pool coverage." The center director and deputy director give the forecast to millions of viewers and listeners through near constant interviews – one every four minutes for as long as 20 hours. NOAA Web sites receive hundreds of millions of hits for each landfalling storm. What's more, FEMA has a crew of experts in a satellite office inside the hurricane center itself. This expedites its coordination with emergency managers.

The Lockheed WP-3D (left) and Gulfstream IV (right) Hurricane Hunter aircraft are two of many methods NOAA uses to aid in observing and predicting hurricanes and major storms. The WP-3Ds have been the primary airborne platforms for NOAA meteorological research, while the Gulfstream IV, acquired in 1996, is a state-of-the-art, high altitude research platform.