

HURRICANE RESEARCH DIVISION

The Hurricane Research Division (HRD) is one of four divisions of the Atlantic Oceanographic and Meteorological Laboratory (AOML). It has a staff of 30, roughly half of whom are Ph.D.-level scientists. Its missions are improvement of forecasts and advancement of basic physical understanding of hurricanes and tropical meteorology. A key aspect of HRD's research is its annual program of research flights aboard reconnaissance aircraft (two WP-3D turboprops and a new Gulfstream IV SP jet) flown by NOAA's Aircraft Operations Center.

CURRENT RESEARCH PROJECTS

Interseasonal to Interdecadal Variations in Hurricane Activity

Gradual northward flow in the Atlantic Ocean appears to alternate between a cooler, lower-salinity phase and a warmer, higher-salinity phase with a 40–50 yr period. The cooler phase correlates with fewer landfalls by major hurricanes (winds > 115 mph) while the warmer phase correlates with more. Any increase in major hurricanes is a concern because they account for 80% of destruction, although they represent only 20% of U.S. landfalls. Hurricane activity in 1995 and 1996 set records, which may point to a return to the active phase after the lull that began in 1970.

Hurricane Track Forecasting

Historically, errors in track forecast have improved about 1% a year. The decrease in errors has accelerated recently through better numerical forecast models and generally improved procedures. Since the early 1980s, HRD has flown the WP-3Ds to measure the winds that control storm motion. The additional data can reduce errors by 16–30%. Beginning in 1997, NOAA's newly commissioned Gulfstream IV SP jet flies similar missions routinely. If warning areas can be reduced by 25%, the reduction in "overwarning" costs could be as much as \$100M per year. Similar annual savings in damage are possible if more accurate and timely warnings can reduce property losses by as little as 1%. Moreover, better track forecasts reduce the likelihood of a hurricane disaster in which thousands might die.

Hurricane Intensity Change

Although we know something about the physical processes that control intensity change in general terms, we do not understand the physics well enough to make predictions that outperform the simplest statistical extrapolations. Meteorologists need to invest in deeper understanding of intensity change before intensity predictions can improve. Fortunately, many of the intellectual and physical tools for this investigation have already been developed to improve track forecasts. Research aircraft missions are essential for study of the oceanic energy source, forcing by the surrounding atmosphere from the surface into the lower stratosphere, and the structures of the storms themselves if future intensity forecasts are to become as reliable as track forecasts are today.

Hurricane Surface Winds

Meteorologists at HRD routinely prepare real-time analyses of hurricane surface winds based upon aircraft and conventional observations. In the hands of forecasters at TPC/NHC, the analyses provide essential guidance for warnings. Extrapolation of the winds onshore can provide an essential preview of damage patterns for emergency managers and other officials. HRD is addressing this crucial problem by coordinating with university scientists and other government laboratories in the HaL (Hurricanes at Landfall) Project.



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