Vaisala Hurricane Applications

The detection, monitoring and prediction of hurricanes is increasingly important, with efforts to give early warning of impending emergencies and hazards. In the United States alone, there are already some 45 million residents along hurricane-prone coastlines – and the numbers are growing.

Hurricanes are products of the tropical ocean and the atmosphere. Powered by heat from the sea, they are steered by the easterly trade winds and the temperate westerlies, as well as by their own ferocious energy. Around their core, winds grow to a great velocity, generating violent seas. Moving ashore, they sweep the ocean inward spawning tornadoes and producing torrential rains and floods. Each year an average of ten tropical storms (of which six become hurricanes), develop over the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Every three years, about five hurricanes strike the United States coastline. Two of the five will be major hurricanes (category 3 or greater, on the Saffir-Simpson Hurricane Scale ranging from a minimum of 1 to a maximum of 5).

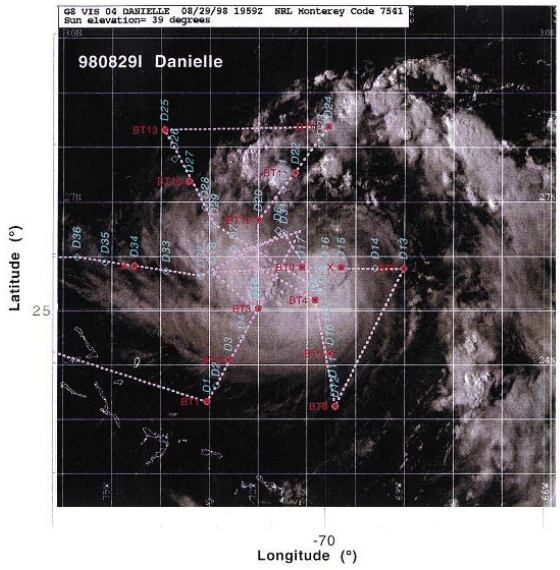
Solutions from Vaisala

In order to warn people of potential hurricane hazards in advance, meteorologists need accurate and reliable detection and forecasting data. This requires special meteorological equipment, such as dropsondes. They are special type of sondes, launched from an airplane straight into an ongoing hurricane.

The dropsonde has been available for dozens of years. Through continuing research, accuracy and data usability have vastly improved, producing an effective operational model. The GPS dropsonde was developed in 1996. The Airborne Vertical Atmospheric Profiling System (AVAPS), which incorporates a RD93 GPS dropwindsonde, is an advanced tool for weather reconnaissance, hurricane and weather research.

The AVAPS dropsonde system uses an integrated, highly accurate, GPS-located atmospheric profiling device RD93 dropsonde, which measures and records current atmospheric conditions in a vertical column below the aircraft. As the RD93 dropsonde floats to the surface on a parachute, it continuously measures and transmits pressure, temperature and relative humidity, as well as GPS-based wind formation data, back to the aircraft. The data is stored onboard for analysis or sent via Satellite Communications (SATCOM) to the ground, every 0.5 seconds. The system architecture supports up to four dropsondes flying simultaneously.

When launched from heights of up to 50,000 ft, the RD93 dropsonde provides complete vertical profile data sets, which will boost continued improvements in hurricane forecasting



The flight path for a NOAA P-3 aircraft on 29 August 1998 is superimposed on a satellite image of Hurricane Danielle. The blue lettering (e.g. D36) indicates drop points for individual GPS dropsondes. The Bahamas are outlined in white at lower left

models, early warning, as well as storm track, speed, and intensity predictions.

The GPS Dropsonde enhances civilian and military efforts to predict hurricane tracks and gives early warning to the population of impending emergencies.

This information completes the historical data void in a hurricane's upper levels, for example, data that will help accurately initialize hurricane prediction models.

The AVAPS system was developed by the U.S. National Center for Atmospheric Research (NCAR), in cooperation with the German Aerospace Research Establishment (DLR) and the NOAA Corps. NCAR has licensed the production of the RD93 GPS dropsonde, which is a key component of the AVAPS, to Vaisala.

Improved Hurricane Forecasts

Given the unique capability of this system to fly through an approaching hurricane, release GPS dropsondes and bring back a complete vertical profile of meteorological data, it is now possible to magnify our global capacity to understand and prepare for hurricanes before they approach landfall.

Computer scientists, meteorologists, risk managers, emergency planners, and the general public all benefit from live updates of an approaching hurricane's interior progress and intensity, as well as from continued improvement in the hurricane forecasting computer model itself.

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