New NASA video gives hurricanes a good 'HIWRAP'

October 7 2014, by Rob Gutro

A new animation from NASA shows how a remarkable instrument called the HIWRAP looks into tropical cyclones at wind, rain and ice to analyze storm intensity.

The HIWRAP is the High-Altitude Imaging Wind and Rain Airborne Profiler, a "conically scanning" Doppler radar, meaning it scans in a cone-shaped manner. Wind measurements are crucial for understanding and forecasting tropical storms since they are closely tied to the overall dynamics of the storm. The HIWRAP instrument is able to measure line-of-sight (along the radar beam) and because it scans in a cone beneath the aircraft, it gets two looks at most parts of the storm, allowing calculations of the 3-dimensional wind and rain fields. In the absence of rain, it can also measure ocean surface winds.

HIWRAP while flying on board an aircraft is capable of examining storms down to a very small scale.

"HIWRAP allows us to see how strong bursts of thunderstorms contribute to the intensification of the low-level wind field in hurricanes," said Research Meteorologist Scott Braun of NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The 2 minute visualization shows how scans from the HIWRAP instrument are done in a cone-like shape over storms, measuring winds within heavy rain throughout.

"What's interesting about the HIWRAP Doppler radar is that it's a dual-frequency and dual-beam radar," said Gerry Heymsfield, Cloud Radar Expert and Research Meteorologist from NASA Goddard. "That means it has two frequencies that measure at two different angles." The instrument scans in a cone shape toward the surface, with the peak of the cone at the HIWRAP radar on the aircraft. "As the plane flies over a particular target—say the eyewall of a storm— scanning it with a cone-shape provides views of the same region from different directions. That's what allows scientists to measure the three-dimensional winds and precipitation within the storm."

The video shows that the HIWRAP sends out about 5,000 pulses a second to get an accurate read on precipitation particles, like rain or ice as the storm and the aircraft are both moving. The signals that bounce back reveal the type, size and distribution of rain or ice particles, as well as how fast the particles are moving. The speed of the particles can help determine the wind and circulation in a storm.

Provided by NASA

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