GOES-R Wind Products
Hurricane Intensity Estimation

FACT SHEET

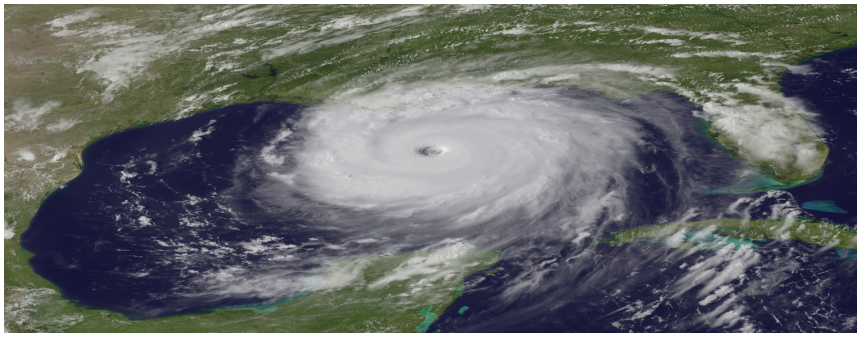
What are the implications of improved hurricane intensity forecasts?

The mission at NOAA's National Hurricane Center (NHC) is to save lives, mitigate property loss and improve economic efficiency by issuing the best watches, warnings, forecasts and analyses of hazardous tropical weather and by increasing understanding of these hazards.

The 2005 Atlantic hurricane season was record-shattering, with 27 named storms, 14 hurricanes and three Category 5 storms. Among those was Hurricane Katrina, the United States' costliest natural disaster and the deadliest since 1928. Katrina was a powerful example of a devastating disaster that could have been even worse if not for the accurate and timely track forecasts and warnings issued by the NHC. While hurricane track forecasts have generally improved, less progress has been made with intensity forecasts. The slow rate of improvement in intensity analysis has prompted the NHC to elevate this issue to its top priority for the tropical meteorology research community. While gains clearly have been made, the losses in Katrina and in other storms show that work remains to be done to fully address the goals set by the NHC.

How will GOES-R address hurricane intensity?

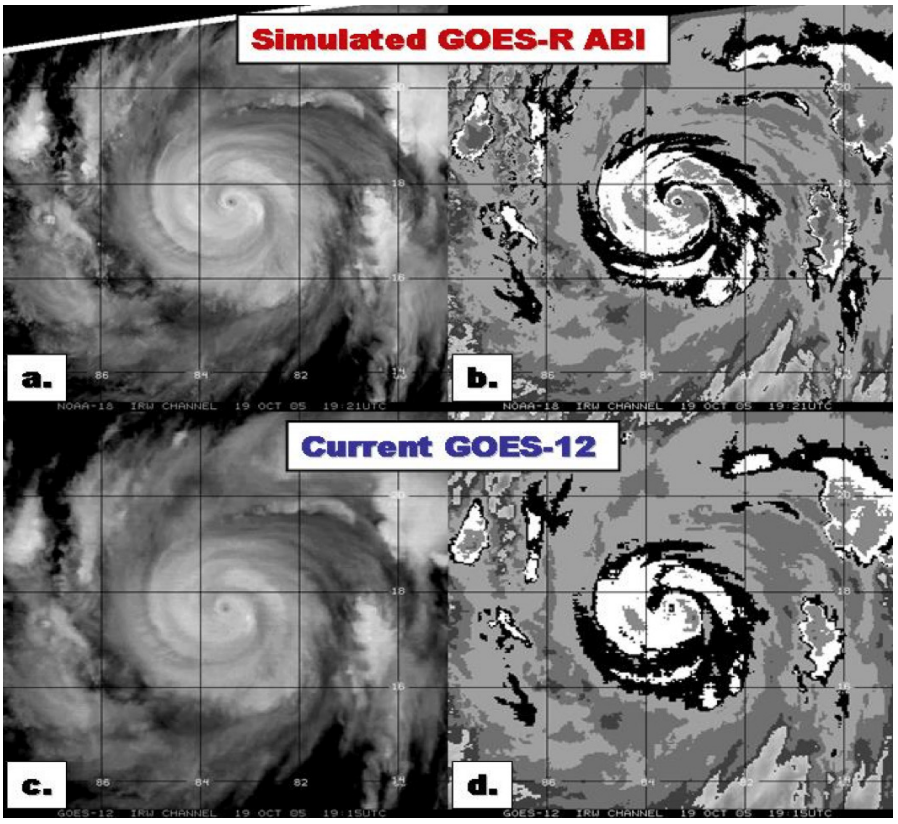
NOAA's Geostationary Operational Environmental Satellites (GOES) have historically been one of the principle tools utilized by NHC as well as NOAA's Central Pacific Hurricane Center (CPHC) and Satellite Analysis Branch (SAB) and the Department of Defense Joint Typhoon Warning Center (JTWC) to monitor hurricane activity. Katrina went from a Category 1 storm to a Category 5 in just 48 hours. This rapid intensification was due to a goldilocks scenario in which atmospheric conditions, storm processes and the ocean environment were "just right." Better understanding and monitoring of these conditions can help forecasters better predict changes in storm intensity. Over the years, algorithms have been developed to estimate hurricane intensity from GOES imagery. The GOES-R **Hurricane Intensity Estimate (HIE)** algorithm will produce real-time estimates of hurricane maximum sustained winds using imagery from the Advanced Baseline Imager (ABI) instrument. This information will be used by forecasters to help assess current intensity trends.



Top: Hurricane Katrina on August 28, 2005 as it approached New Orleans. Middle and bottom images show Katrina's damage along the Louisiana and Mississippi coasts.

How does the Hurricane Intensity Estimation algorithm work?

The **HIE** algorithm is a derivative of the Advanced Dvorak Technique, an objective and fully-automated algorithm that operates on current GOES data and is now used operationally by the NHC. **HIE** will generate real-time hurricane intensity estimates using 10.35µm infrared window channel imagery from the ABI. The improved performance and higher spatial resolution of this instrument provides greater accuracy of feature attributes as well as the ability to detect even smaller features, allowing for better characterization of small hurricane eyes. The primary products that will be generated by the **HIE** algorithm include an intensity estimate analysis from the most current satellite image being interrogated, as well as additional information about the intensity trend of the analyzed storm. Graphical illustrations and textual listings of the hurricane intensity estimates will be viewable and distributed to the user community in real time.



Simulated GOES-R ABI infrared imagery with black/white contrast stretch (a) and "hurricane" enhancement (b) compared to current GOES-12 imagery (c and d) for Hurricane Wilma on October 19, 2005. The contrast stretch/enhancements illustrate the ABI's improved capability to capture small hurricane eye features.

The **HIE** product can be used in conjunction with data from the GOES-R Geostationary Lightning Mapper (GLM) instrument. GLM, the first operational lightning mapper flown in geostationary orbit, maps total lightning (in-cloud and cloud-to-ground) continuously over the Americas and adjacent ocean regions. Data from GLM will inform forecasters about changes in lightning activity in the eyewall and rainbands of hurricanes, which can be used in combination with data from the ABI as an indication of intensity changes, especially rapid intensification.

What are the benefits?

NOAA's National Hurricane Center issues hurricane analyses, forecasts and warnings for the U.S. coastline as well as large parts of the North Atlantic and Pacific Oceans, and in support of many nearby countries. The advanced observational capabilities available from GOES-R will enable forecasters to make more accurate estimates of hurricane intensity, leading to improved forecasts and extended forecast lead times. The new information from GLM and ABI will also improve forecasts through better hurricane model initialization.

Learn more

- http://tropic.ssec.wisc.edu/real-time/adt/adt.html
- http://www.ospo.noaa.gov/Products/ocean/tropical.html