Tropical Cyclone Heat Potential

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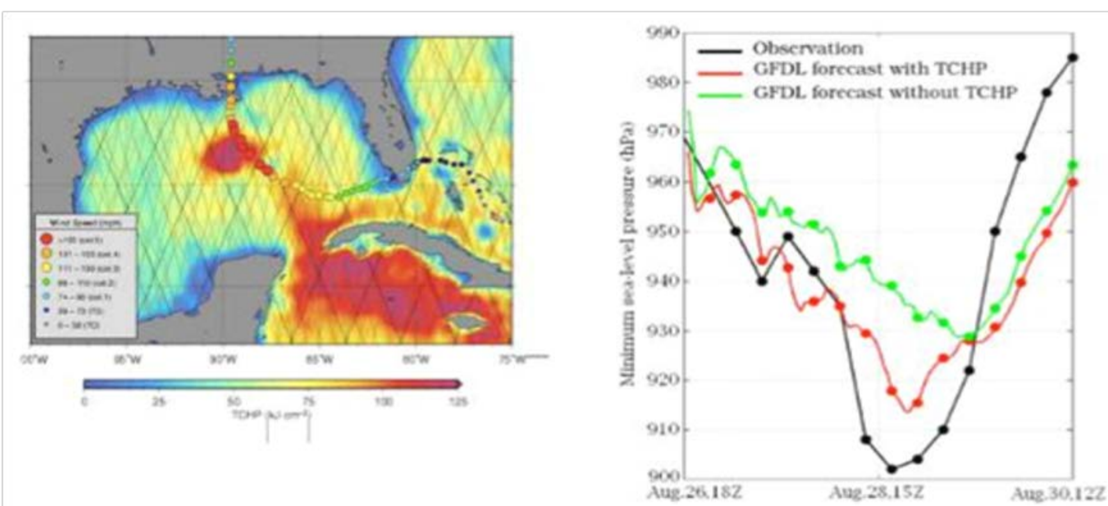
Sudden tropical cyclone (TC) intensification has been linked with high values of upper ocean heat content contained in mesoscale features, particularly warm ocean eddies, provided that atmospheric conditions are also favorable. Tropical cyclones occur in seven ocean basins: tropical Atlantic, northeast Pacific, northwest Pacific, southwest Indian, north Indian, southeast Indian, and south Pacific. The intensification of TCs is very complex with influences from TC dynamics, upper ocean interaction, and atmosphere circulation. In general, the accuracy of TC intensity forecasts has lagged behind TC track forecasts because of the complexity of the problem and because many of the errors introduced in the track forecast are translated into the intensity forecast (DeMaria *et al.*, 2005). The importance of the ocean thermal structure in TC intensification was first recognized by Leipper and Volgenau (1972). While sea surface temperature (SST) plays a role in the genesis of TCs, the ocean heat content contained between the sea surface and the depth of the 26°C isotherm, also referred as Tropical Cyclone Heat Potential (TCHP), has been shown to play a more important role in TC intensity changes (Shay *et al.*, 2000). The TCHP shows high spatial and temporal variability associated with oceanic mesoscale features. TC intensification has been linked with high values of TCHP contained in these mesoscale features, particularly warm ocean eddies, provided that atmospheric conditions are also favorable. Since sustained *in-situ* ocean observations alone cannot resolve global mesoscale features and their vertical thermal structure, different indirect approaches and techniques are used to estimate the TCHP. Most of these techniques use sea surface height observations derived from satellite altimetry, a parameter that provides information on the upper ocean dynamics and vertical thermal structure. AOML posts real-time fields of TCHP at: http://www.aoml.noaa.gov/phod/cyclone/data/.



(left) Track of Hurricane Katrina (2005) in the Gulf of Mexico superimposed on the altimetry-derived tropical cyclone heat potential field. The path of this TC shows an intensification when the hurricane traveled over a warm ring. (right) Minimum atmospheric pressure at sea level during the passage of hurricane Katrina in the Gulf of Mexico in 2005, showing the actual observations (black), and the reduction of error in the GFDL model output with (red) and without (green) initializing the model with the TCHP produced at NOAA National Hurricane Center.