The Influence of Hurricane Katrina on Water Quality in Florida Bay and Surrounding Coastal Waters

Ryan H. Smith[1], Elizabeth Johns[1], Shailer R. Cummings[1], Peter B.Ortner[1], Christopher Kelble[2], Nelson Melo[2], and Thomas N. Lee[3]

[1]NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami, FL, USA
[2]Cooperative Institute for Marine and Atmospheric Studies, U. of Miami, Miami, FL, USA
[3]Rosenstiel School of Marine and Atmospheric Science, U. of Miami, Miami, FL, USA

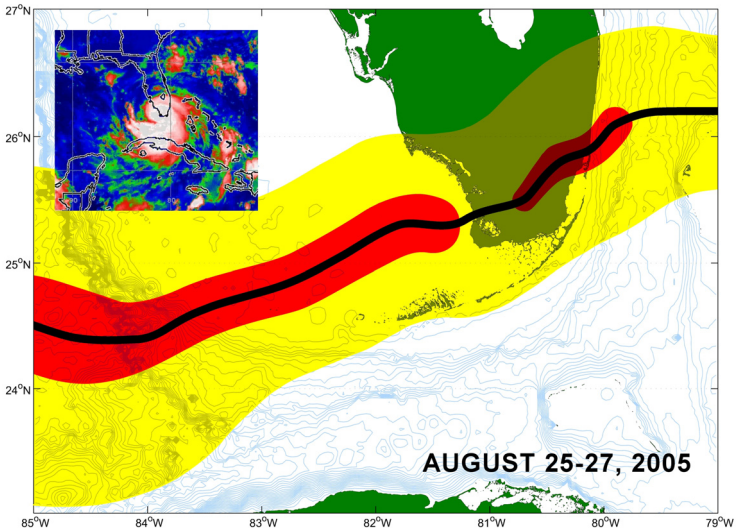

Figure 1. Tropical storm (yellow) and hurricane (red) strength winds affect south Florida and the surrounding coastal ocean in late August 2005.

Prior to its devastating effects on Louisiana and Mississippi, Hurricane Katrina crossed south Florida as a category one hurricane in late August 2005. Synoptic events, such as the passage of tropical cyclones, can have a significant impact on water quality in areas where coastal waters are particularly shallow such as Florida Bay, the Southwest Florida Shelf, and the Florida Keys reef tract. Tropical storm and hurricane force winds affected south Florida and the surrounding coastal ocean from August 25th through the 27th (Figure 1). The rapid precipitation, runoff, and direct wind forcing associated with Katrina produced measurable changes in these waters.

As part of a long-term study funded by the National Oceanic and Atmospheric Administration's (NOAA) Coastal Ocean Program (COP), scientists from NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML), the University of Miami's (UM) Rosenstiel School of Marine and Atmospheric Science (RSMAS), and the University of South Florida's (USF) College of Marine Science (CMS) monitor the physical, chemical, and biological properties of south Florida coastal waters on a regular basis. Scientists utilize bimonthly regional hydrographic surveys, monthly bay surveys (Florida and Biscayne), moored instrumentation, Lagrangian drifters, and remote sensing techniques to gain a more comprehensive understanding of how regional flow patterns and the resulting spatial distribution of water properties are influenced by the Gulf of Mexico, the Straits of Florida, and runoff from the south Florida watershed. These water properties (salinity, chlorophyll concentration, turbidity, dissolved organic matter, etc.) and their spatial distribution are a direct measure of the condition of south Florida coastal ecosystems.

Preceding Hurricane Katrina's passage through the region, routine hydrographic surveys collecting continuous flow-through measurements and discrete vertical station measurements of salinity, temperature, fluorescence, and transmittance were completed on the Southwest Florida Shelf, the Florida Keys reef tract, and in Florida and Biscayne Bays. During these surveys, moored instrumentation deployed about the region, including acoustic Doppler current profilers (ADCP), conductivity/temperature sensors (CT), fluorometers, and transmissometers, were recovered, refurbished, and redeployed. Additionally, the region was seeded with three Lagrangian shallow water surface drifters at Charlotte Harbor, Shark River, and the Dry Tortugas.

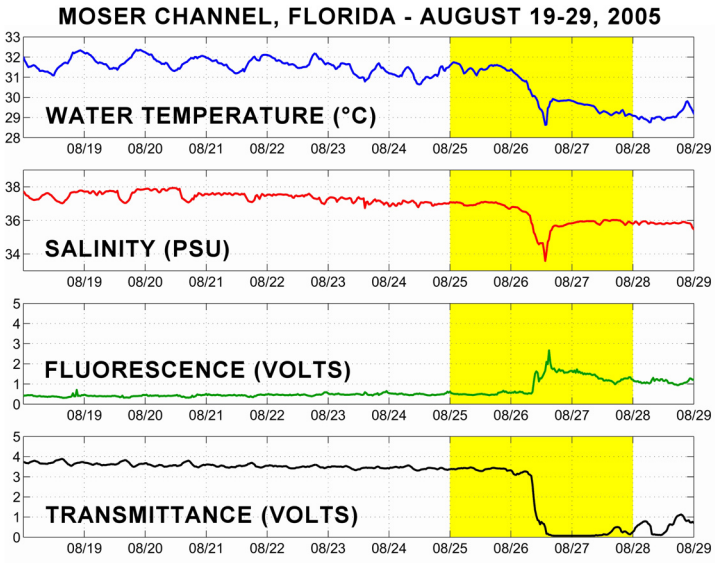

Figure 2. Moser Channel Oceanographic Monitoring Station records the passage of Hurricane Katrina (highlighted in yellow).

Following the storm, rapid response hydrographic surveys were conducted in Florida and Biscayne Bays. Preliminary results from these surveys show a marked decrease in salinity due to direct precipitation and extensive runoff through canals and rivers around the region. An increase in chlorophyll concentration and water turbidity (decreased transmittance) was also recorded, likely due to the resuspension of sediments and associated microphytes caused by wind driven mixing of the water column. These survey results agree with data recorded at real-time stations in the moored array. Shown in Figure 2, the influence of the tropical cyclone can be seen in the data logs from Moser Channel Real-Time Oceanographic Monitoring Station, located at the Seven-Mile Bridge in the Florida Keys (http://www.aoml.noaa.gov/sfcoo/7MB/). In addition, drifter trajectories during late August (not shown) emphasized the effects that tropical cyclones can have on the regional circulation, recording translations of up to 20 nautical miles in 24 hours (http://www.aoml.noaa.gov/sfcoo/SFP_drifters/). Moored non-real-time data covering the time period of this synoptic event will be compared with collected survey data, drifter trajectories, and moored real-time data following scheduled instrumentation recoveries in October 2005.

Contact Information: Ryan H. Smith, NOAA/AOML/PhOD, 4301 Rickenbacker Causeway, Miami, FL 33149, USA, Phone: 305-361-4328, Fax: 305-361-4412,
Email: ryan.smith@noaa.gov