Bilge Tutak and Y. Peter Sheng

Hurricanes are becoming more frequent and intense as the result of decadal cycle and global warming. In addition to causing property damage and loss of lives, hurricanes can significantly affect estuarine and coastal ecosystems through precipitation, inundation, shore erosion, and destruction of marshes and aquatic vegetation by strong winds and currents. During the hurricane season of 2004, four hurricanes went through Florida: Charley, Frances, Ivan, and Jeanne during august and September. While none of these hurricanes directly passed through the estuarine system of the Guana-Tolomato-Matanzas National Estuarine Reserve (GTMNERR), salinity inside the estuarine system remained at abnormally low values for four months. The low salinity killed shell fish and it took several months to recover. This paper presents a quantitative study on the effect of hurricanes on circulation and salinity inside the GTMNERR estuarine system. As a first step, extensive meteorological and hydrodynamic data during May through October, 2004 are analyzed to identify the relationship between the hydrodynamic conditions and the meteorological/hydrological forcing functions. It is hypothesized that hurricanes significantly altered the exchanges within two tidal inlets – St. Augustine Inlet and Matanzas Inlet. A three-dimensional baroclinic hydrodynamic modeling system is then used to examine the hypothesis and to compare with the measured data inside the estuarine system. The modeling system successfully simulated the measured currents within the two tidal inlets in 2005.