NGOMEX 2006 - Mechanisms Controlling Hypoxia: Real-time Observations

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Abstract/Project Summary

Hypoxia has been a problem on the eastern Texas-Louisiana shelf since at least the 1970s. The area affected by the low dissolved oxygen concentrations has grown during the 1990s prompting the implementation of the Gulf of Mexico Watershed Action Plan, which is designed to reduce the 5-yr mean size of the hypoxic zone to less than 5000 km^2 by the year 2015.

The processes that control and maintain the hypoxic zone in this region are complex and their relative strengths are known to vary temporally and spatially. Although close to the Mississippi River Delta, the mechanisms that maintain and sustain the hypoxia are mostly driven by biological processes, further downstream the dominant controlling processes are mostly physical as currents and winds combine to break down the vertical stratification necessary to sustain the low dissolved oxygen. Because the eastern region of the shelf, between 91°W and 89°W, is almost always hypoxic in mid-summer, it is variability of the western region, between 91°W and the Texas border, that largely controls the total size of the hypoxic area in a given year. *Therefore, understanding the interactions of the physical, biological, and geochemical processes on the western shelf is critical for a comprehensive description of the mechanisms that control hypoxia.*

An integrated, multidisciplinary study of the middle and western Louisiana Shelf is proposed that includes moored and remote sensing real-time multidisciplinary observations designed to complement a coupled physical-biogeochemical numerical modeling element. This program builds upon a previous study (2003-2006) in which targeted process-oriented high spatial resolution hydrographic surveys, multidisciplinary moored observations, and a coupled modeling element all point to small (order 10 km) temporal and spatial scales of variability of hypoxia on the middle and eastern Louisiana Shelf.

The scientific objectives of this study are to investigate: (i) short- and long-term variability in currents, stratification, and hypoxia in the downstream region of the hypoxic zone, (ii) how benthic and water column respiration rates in the western shelf region differ from regions closer to the Mississippi River Delta, (iii) to produce a realistic coupled physical-biological geochemical numerical model of the northeastern Gulf of Mexico.

To achieve the scientific objectives of this study, three heavily instrumented moorings will be deployed that will report observations in near real-time. One of the moorings will be placed in 10-m water depth south of Cameron, LA, near the Texas-Louisiana border and TABS (Texas Automated Buoy System) Buoy R. A second mooring will be placed

further offshore in 20-m depth near 29.3°N, 93°W. The last mooring will be south of the Atchafalaya Bay at 92°W, 29°N. Additionally, a series of hydrographic stations will be occupied around each mooring site to understand the local scales of interaction. An existing coupled physical-biological circulation model will be enhanced with more realistic sedimentation and geochemical components.