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Comments on "Hypoxia in the Northern Gulf of Mexico: An Update by the EPA Science Advisory Board," 8-30-07.

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Hypoxia requires hydraulic isolation of bottom water by density stratification and oxygen consumption in the bottom layer by degradation of organic matter (pp. 23, lines 20-21). The Science Advisory Board (SAB) Update believes that the source of this oxygen consumption is well constrained: algae produced by nutrients delivered from the Mississippi and Atchafalaya River Basin (MARB). The recommendations of the SAB to reduce nitrogen (N) and phosphorus (P) fluxes from the MARB are based upon this characterization of the problem.

The recent findings cited by the Update correctly constrain and minimize the importance of Mississippi River nutrients in promoting hypoxia. Sedimentation of phytoplankton produced by water from the Mississippi River to the bottom can contribute only 23 percent of the observed hypoxia (Dagg et al., 2007 cited on pp. 44, lines 30-34). This is compounded by the fact that appreciable amounts of this Mississippi-derived sediment are transported offshore (pp. 43, lines 15-18). Thus, while the Mississippi accounts for 70 percent of the flow from the MARB, it accounts for only a minor fraction of the observed hypoxia.

The Update recognizes the role of Atchafalaya capture and transfer of MARB water to the LATEX shelf as increasing the shelf area with the potential for hypoxia but discounts the Atchafalaya's role in creating hypoxia because change in flow stabilized before the onset of hypoxia in the mid-1970s and hypoxia's subsequent increase during and after the 1993 flood (pp.23-25, 31, 51).

However the Update does not recognize that the Atchafalaya River's input of sediment to the Gulf did not stabilize with the stabilization of its flow in 1963 by the US Army Corps of Engineers. Lakes and backwaters along the Atchafalaya were still retaining much of the river's sediment load, preventing a large portion of the sediment from reaching the coast. Floods accelerate the filling process and increase the efficiency of sediment transfer to the Gulf. The SAB Update does not recognize that river deltas are highly dynamic, flood-sensitive environments, changes in which have profound effects on the physical, chemical, biological and hydrological characteristics of coastal lands and their surrounding waters. That the great floods of 1973 and 1993 represent regime changes ─ the onset of annual seasonal hypoxia and its enlargement, respectively, the latter in the face of declined N input and essentially unchanged P input ─ implicate factors other than stratification and the Update's characterization of MARB-borne nutrients. The Uptake should seek to identify these other factors.

Krug (2007) and Krug and Merrifield (2007) have identified increasing sediment delivery to the LATEX shelf by the Atchafalaya River as important to bottom water oxygen depletion and the resultant development and enlargement of Gulf hypoxia. The Atchafalaya River diversion resembles previous events which produced oxygen depletion in Gulf coastal waters by depositing water and sediment into shallow coastal shelves

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whereas the modern Mississippi River does not in that for the last two centuries its discharge has been at the deep waters on the edge of the continental shelf.

In summary, the SAB's understanding of Gulf hypoxia is not well constrained and its recommendations of land management practices and consideration of tightening effluent standards to achieve even steeper cuts in MARB nutrient loads to combat regime change in Gulf hypoxia is misplaced.

Dagg, M, Ammerman, J., Amon, R., Gardner, W., Green, R. and Lohrenz, S. Water column processes influencing hypoxia in the northern Gulf of Mexico. http:/www.epa.gov/msbasin/taskforce/pdf/session4dagg.pdf

Krug, E.C. 2007. Coastal change and hypoxia in the northern Gulf of Mexico: Part I. Hydrol. Earth Syst. Sci. 11:180-190.

Krug, E.C. and Merrifield, K. 2007. Marine modification of terrestrial influences on Gulf hypoxia: Part II. Hydrol. Earth Syst. Sci. 11:191-209.