

LESSONS LEARNED FROM A ONE-DIMENSIONAL WATER QUALITY MODEL FOR THE GULF OF MEXICO

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Hypoxia in the northern Gulf of Mexico has been a major concern for many years. Several water quality models have attempted to describe the link between high nutrient loads from the Mississippi River and hypoxia in the Gulf of Mexico – with varied success. Here we describe the development, calibration and application of a one-dimensional mechanistic model for the northern Gulf of Mexico. The model is driven by light, temperature, nutrient concentration, and vertical exchange. The model was tested at multiple locations in the Gulf using an extensive data set of state variable concentrations and process experiments such as primary production and respiration. Model results provide valuable information in terms of understanding processes, testing kinetic equations, estimating model coefficients and performing sensitivity analysis that can directly be used in a high-resolution three-dimensional model which is currently under development. The model also estimates the relative importance of algal respiration, dissolved organic carbon oxidation (bacterial respiration), nitrification and sediment oxygen consumption on Gulf hypoxia with some surprising results.