



**Title** Interannual variation in summer  $N_2O$  concentration in the hypoxic region of the northern Gulf of Mexico, 1985-2007

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**Abstract** We present evidence of temporal variation in nitrous oxide ( $N_2O$ ) concentrations in the bottom waters of the northern Gulf of Mexico (nGOM) hypoxic zone. The analysis is based on a conceptual model simulating  $N_2O$  biogeochemical processes in conjunction with water-column  $O_2$  levels, derived from summer Texas–Louisiana shelf-wide hydrographic data for twenty Julys between 1985 and 2007. The mean modeled nGOM  $N_2O$  concentration was  $7.7 \pm 6.7 \text{ nmol L}^{-1}$ , and was significantly correlated with the areal extent of hypoxia. Our modeling analysis indicates that the nGOM is a persistent summer source of  $N_2O$ , and nitrification is a primary factor leading to its production in this region. Based on the ongoing increase in the areal extent of hypoxia in the nGOM, we conclude that  $N_2O$  emission from this environmentally stressed region will continue to increase into the future contributing to the global increase in greenhouse gases.