Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.29551

Salinity and seawater oxygen isotope measurements along the U.S. Eastern Seaboard - implications for paleoclimate and paleoceanography reconstructions

ALEX A QUIZON, SIERRA V PETERSEN AND LUCAS D GOMES

University of Michigan

Oxygen isotope thermometry (δ18Ocarb) is a widely used proxy in paleoclimate yet relies on assumptions about the δ18O of the precipitating fluid (δ18Owater, or 'δ18Ow'), as δ18Ocarb is largely a function of formation temperature *and* δ18Ow. Although we can assume paleo-δ18Ow based on knowledge of modern instrumental δ18Ow, gaps in the modern record give rise to uncertainties in these assumptions. Methods such as clumped isotope thermometry (Δ47) now allow us to estimate paleo-δ18Ow from fossil archives, yet these uncertainties hinder our ability to evaluate paleo-δ18Ow properly. On the other hand, δ18Ow *is* well-known to covary with salinity. Previous studies have developed regionally coherent δ18Ow-salinity relationships for water masses around the world, introducing the framework to interpret paleo-δ18Ow as a water mass tracer. However, δ18Ow and salinity can vary on short spatial and temporal scales, begging the question of whether these relationships should be more localized. One practical region to investigate is the U.S. Eastern Seaboard, as the interactions between the Labrador Current and Gulf Stream produce significant spatiotemporal variability in both δ18Ow and salinity.

This study aims to address two primary questions: (1) How uncertain are δ18Ow values used for δ18Ocarb-paleotemperature reconstructions? (2) Can δ18Ow be used as a water mass tracer along the Eastern Seaboard? In this study, we present hundreds of new salinity and δ18Ow measurements from the Eastern Seaboard, adding to the existing global instrumental δ18Ow dataset. We use these data to define a clear geochemical boundary between the Labrador Current and the Gulf Stream in the modern, which will pave the way for defining this boundary in the past. We also compare our observational data to model output to assess the validity of the models. In doing so, we evaluate δ18Ow as a paleoclimatic and paleoceanographic tool and determine the contexts in which δ18Ow measurements are useful.