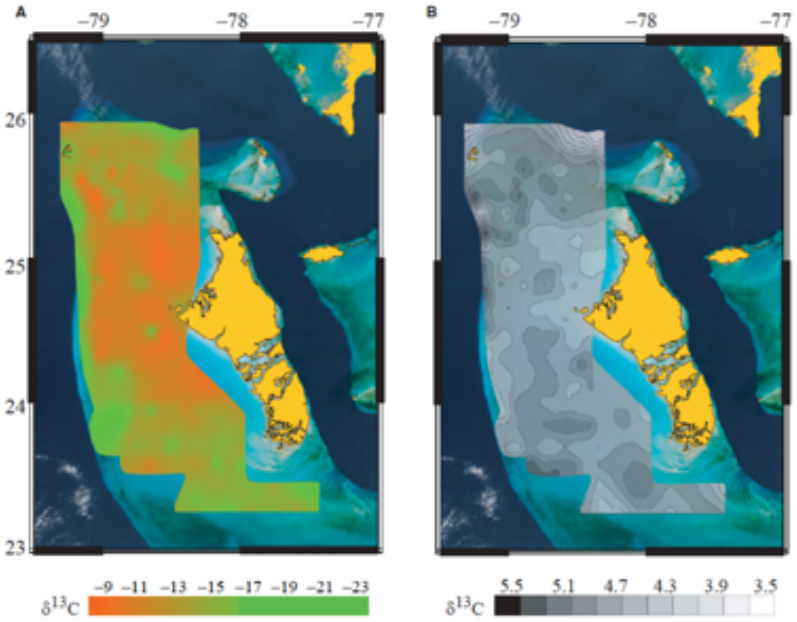
Understanding Covariance in Marine Carbonates and Organic Matter

Carbon isotope records from marine carbonates and sedimentary organic matter have been used to reconstruct the concentrations of carbon dioxide and oxygen in Earth's atmosphere, assess significant biological evolutionary steps, and constrain biogeochemical cycling through geological time. These interpretations are based upon the concept that the isotopic composition of marine carbonate and co-occurring sedimentary organic matter should exhibit the same changes through time if they are accurate archives of changes in the global carbon cycle. However, recent work suggests that processes such as syn-depositional and diagenetic source mixing can impact the covariation between the stable carbon isotope ($\delta^{13}C$) composition of carbonates and organic matter can also produce covariation. In this project, the student will investigate the physical, chemical, and biological controls on carbon isotope covariance, and generate a construct for understanding conditions that promote and suppress carbon isotope covariance in modern carbonate depositional environments from around the world.



Maps of the stable isotope composition of the (A) sedimentary organic matter and (B) carbonate sediments from the surface of Great Bahama Bank showing a lack of spatial covariance between the two isotope records. *Figure from Oehlert et al., 2012.*

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