

ORAL PRESENTATION

LEARNING FROM FOSSIL DIATOM RECORDS ABOUT PAST ENVIRONMENTAL CONDITIONS IN TWO SUBTROPICAL SOUTH FLORIDA ESTUARIES

Wachnicka, A.¹, Gaiser, E.¹ and Collins, L.²

¹ Southeast Environmental Research Center, Florida International University, Miami, FL, USA.

² Department of Earth and Environment, Florida International University, Miami, FL, USA.
(wachnick@fiu.edu)

The ecology of South Florida estuaries has been greatly affected in the last century by the intensive urban development in South Florida. Construction of flood-protection structures and expansion of agricultural areas caused changes of quantity and quality of water that is being delivered into adjacent estuaries. These changes have been superimposed on long-term climate-driven changes and sea level rise. Due to the planned water management changes related to the Comprehensive Everglades Restoration Project, which aims to increase freshwater flow to the adjacent bays, it is important to determine the impact that these changes had on the bays' environment and establish the pre-impact salinity and water quality conditions in order to aid selection of appropriate restoration targets for South Florida estuaries.

In order to accomplish these goals we developed salinity, phosphorus and nitrogen transfer functions since they will most likely be affected by the aforementioned changes the most, and applied them to ~ 150 years old fossil diatom records in seven sediment cores collected in Florida Bay and Biscayne Bay. Additionally, we established the amount of change in diatom species composition in those cores to determine the impact that the modified water quality conditions had on diatom communities. Stratigraphically constrained cluster analysis of diatom data revealed that major compositional changes at coring locations situated near the coast occurred ~ 1960 A.D., which corresponds to the construction of large water conservation areas south of Lake Okeechobee. Major alterations of diatom communities in areas located further away occurred in different periods of time. Reconstructions of past salinity and nutrient conditions showed that the post-1900 salinity increased at some nearshore locations in Florida Bay and northern Biscayne Bay, while at the same time phosphorus and nitrogen concentration in the water decreased. These findings imply that modifications of the amount of surface water flow into the estuaries affected salinity conditions at those locations, while decrease influx of nutrient-rich ground water influenced nutrients concentration. Lack of significant differences between pre- and post-impact salinity and nutrient conditions at off-shore locations imply that environmental conditions in those areas are mostly influenced by natural drivers. Although environmental changes were not always significant at the study sites, the compositional changes in diatom communities were very distinct, especially at nearshore locations. This implies that even small environmental disturbances affect composition of diatom assemblages, which can be interpreted as an early warning sign of Florida Bay and Biscayne Bay ecosystems degradation.