An Investigation of Sedimentary Pyrite as an Indicator of Drought in Mid-Coast Maine

Phoebe Aron, 2013

The concentration of sedimentary sulfur and iron in Merrymeeting Bay sediments were measured to study past climate history in Mid-Coast Maine. We focused on sediment signatures accumulated during the Medieval Warm Period (800-1300 AD), a warming event that has not been fully explored in Maine and is an important period to understand as we tackle current climate change. We investigated these signatures in a sediment core we obtained from the Abby River, an input source into Merrymeeting Bay. Sediment cores contain a continuous, high-resolution depiction of sediment chemistry and thus an opportunity to study climate events and element cycling. Specifically, sulfur and iron were studied to quantify the formation of sedimentary pyrite, which we use as a proxy to study water cycles and drought events in the Merrymeeting Bay estuary. We explain an increase in sedimentary pyrite through an intrusion of sulfate rich ocean water under drought conditions. A decrease in sulfate-poor freshwater flow out of the estuary allows for an increase in sulfate-rich ocean water up into the estuary. We focus our investigation on pyrite (FeS₂) because pyrite is the end product of a simultaneous reduction of sulfate and iron (III). Sedimentary elemental concentrations were measured by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) analysis following a 15.9 M nitric acid digestion. Measured at a down river coring site, the concentration of sulfur peaks at 30 cm with more sulfur in the top 80 cm than in deep sediments. To complete this work, we will finish sulfur and iron analysis from the down river coring site and compare pyrite signatures from an second core taken at an up river coring site. This study will give insight into past climate anomalies and give history, direction, and context to future climate change research.

![Graph](image)

Figure 1. Concentration of sedimentary sulfur measured from Merrymeeting Bay core obtained from down river coring site on the Abby River, Bowdoinham, Maine, USA.

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