

# Unlocking Arctic Mechanisms of Carbon Storage through Physical and Chemical Sediment Analysis

Fedio, Caitlin <sup>1</sup>, Peteet, Dorothy <sup>2,3</sup>, Nichols, Jonathan <sup>2,3</sup>

<sup>1</sup> Columbia University, New York, NY, <sup>2</sup> Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, <sup>3</sup> Goddard Institute of Space Studies, New York, NY

Arctic soils serve as an enormous store of carbon, believed to contain as much carbon as the entire atmosphere. Carbon is sequestered by plants, particularly in wetland regions, through metabolic processes and is well preserved for extended periods of time in moist and cold environments. However, it is still poorly understood how carbon storage is impacted by changes in climate. To explore this question, we looked at an Arctic Alaskan sediment core from a drained shallow lakebed. Radiocarbon dating of seeds in the core revealed that it dates back to approximately 15,000 years before present. The sample was analyzed in two centimeter intervals using both physical and organic chemical proxies to draw conclusions about changes in carbon flux, vegetation, and climate over the past several thousand years. These processes consisted of loss on ignition and macrofossil identification, as well as hydrogen isotope analysis of the n-alkanes in leaf waxes. These procedures allowed us to reconstruct the paleoclimate and better understand the climate and vegetation of the Arctic Alaskan region in relation to carbon flux over time. This sediment core is particularly interesting because it depicts changes that occurred during the transition from the Pleistocene to the Holocene, about 10,200 years ago. The data reveal a warmer, wetter climate during the early Holocene, accompanied by a rise in the lake's water level. This period also correlates with higher annual carbon accumulation and storage. We can compare this site to other Arctic regions to see how climate change has impacted, and to predict how it will continue to impact, carbon storage in these valuable locations.