

Leaf Wax *n*-Alkane Distributions and Stable Isotope Ratios, Paleovegetation, and Dust Flux to Reconstruct North Pacific Climate During the Late Holocene

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We combined reconstructions of peatland carbon flux, paleovegetation, hydrogen isotopes of precipitation, and dust flux on Middleton Island, AK to reconstruct Pacific Decadal Oscillation (PDO) over the past 6,000 years at sub-decadal resolution. Middleton is a tectonically uplifted island in the Gulf of Alaska, and is perfectly positioned to record changes in climate over the North Pacific. Organic matter accumulation at the site, determined by radiocarbon dating, is closely related to the site's hydrology. Climate-related vegetation changes are determined using distributions of leaf wax *n*-alkanes, pollen, and macrofossils. D/H ratios of leaf wax *n*-alkanes reconstruct temperature and hydroclimate changes, while dust flux measurements provide paleo-wind information. We sampled the upper portion of the Middleton Island peat stratigraphy at 0.25 cm resolution (approximately annual) to establish a connection between our paleo-proxies and the instrumental climate record. We then analyzed the entire stratigraphy at 1 cm resolution (4-6 years per sample) to complete a record of North Pacific climate spanning ~6,000 years. Beyond the importance of this record to our understanding of the climate system, our record of climate and dust flux at Middleton impacts our understanding of the role of dust in the global carbon cycle. Iron-rich dust—such as that carried offshore from the Alaskan mainland—is crucial for marine productivity, especially in the Fe-limited North Pacific. By reconstructing climate and dust flux in the same samples at this sensitive location, we can better understand the climate conditions that favor the North Pacific as a carbon sink.