Reconstructing Paleoclimate and Carbon Storage of Alaskan Peatlands During the Holocene

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We examined the rate of carbon storage and its relationship to changing climate and vegetation in a transect of Alaskan peatlands spanning 12 degrees of latitude. These peatlands can act both as sources and sinks for atmospheric carbon, and their status is highly sensitive both to climatic shifts and to vegetation assemblage. It is unknown whether future warming in the Arctic will stimulate productivity, thereby increasing organic accumulation and carbon storage, or initiate higher decay rates and trigger the release of stored carbon. We reconstructed carbon flux, effective moisture, and vegetation assemblage using loss on ignition and AMS carbon-14 dating of plant macrofossils; hydrogen isotope ratios of specific organic biomarkers; and biomarker distributions and macrofossil counts. By reconstructing both carbon flux and paleoclimate of peatlands within in the same samples, we observe how climate and peatland carbon storage are interconnected. We find that times when peatlands are under more evaporative stress, sedge communities take over the peatland, and less carbon is stored. *Sphagnum*, the most effective taxa for sequestering carbon, is more abundant during times when effective moisture is higher in peatlands. Further, we find that moisture balance at our Alaskan peatland sites is controlled by the interplay between atmospheric conditions over the Arctic and north Pacific Oceans, a dynamic highly sensitive to anthropogenic warming.