HIGH-RESOLUTION RECORDS OF MID-HOLOCENE PALEOCEANOGRAPHIC CHANGE FROM THE SUBARCTIC NORTHEAST PACIFIC OCEAN

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We present data from four new ultra-high resolution (SAR >2 mm/yr) marine sediment cores recovered along the margin of the Gulf of Alaska region in the Subarctic Northeast Pacific Ocean (SNEPO) recording fluctuations in detrital, biogenic, & authigenic sedimentary components. These regional records of climate change indicate four major regimes since the onset of the Holocene along the SNEPO margin. One of the most distinctive environmental shifts was the change from the relatively warm & moist conditions of the early Holocene Thermal Maximum (HTM) into colder & drier conditions that occurred between approximately 3000 - 7000 cal yrs BP in this high-latitude region. There is a key shift in both paleoproductivity proxies and redox-sensitive trace metal accumulation rates associated with this climatic transition. Based on observations of modern atmosphere-ocean-ecosystem interactions operating in the SNEPO, we interpret these biogeochemical shifts to reflect a change in the baseline mechanics of the atmospheric Aleutian Low (AL) pressure cell. The AL is the principal driving force that leads to nutrient upwelling in the Alaska Gyre, as well as the mechanism that controls coastal stratification via precipitation input & associated fluvial runoff. The measured changes in productivity and trace metals imply a millennial-scale oscillation in upwelling intensity and concomitant horizontal advection towards the more stratified waters of the coastal SNEPO. This oscillatory behavior lasts only 3000 years and terminates during a widespread glacial advance, when paleoproductivity indicators increase monotonically into the late Holocene. Both the magnitude and the millennial-scale frequency are statistically different from observational data of modern conditions in the SNEPO, suggesting that different mechanisms controlled the atmosphere-ocean-ecosystem linkage over this earlier time interval. Changes in high-latitude Northern Hemisphere summer insolation coupled to complex ocean-atmosphere feedbacks may be responsible.