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Nutrients cycling in response to opal productivity during the last 600 kyr in the Bering Sea (IODP Exp. 323 Site U1343): diatom silicon isotope and sedimentary nitrogen isotope

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Multidisciplinary paleoceanographic proxies (biogenic opal, diatom silicon isotope, and sedimentary nitrogen isotope, benthic foraminifera oxygen isotope) were analyzed for Site U1343 of IODP Exp. 323, in order to investigate the degree of nutrient utilization in response to glacial-interglacial changes of opal productivity in the Bering Sea. According to oxygen isotope of benthic foraminifera, an age model for Site U1343 represents a record of 600 ka. High diatom silicon isotope values during interglacial periods were attributed to increased opal production under nutrient-replete conditions, which would have resulted in higher silicic acid utilization along with increased diatom productivity. In contrast, low diatom silicon isotope values during glacial periods were caused by reduced opal production due to extensive sea ice. Such condition can lead to lower silicic acid utilization along with decreased diatom productivity. Thus, silicic acid cycling between subsurface and surface waters was active during interglacial periods, but weak during glacial periods. High sedimentary nitrogen isotope values generally occurred with high biogenic opal, particularly during warm (low oxygen isotope) periods, indicating higher nitrate utilization with increased diatom productivity. In contrast, low sedimentary nitrogen isotope values were found primarily in conjunction with low biogenic opal particularly during cold (high oxygen isotope) periods, reflecting lower nitrate utilization with decreased diatom productivity. Thus, nitrate cycling between subsurface and surface waters was active during warm periods and weak during cold periods. Diatom productivity at Site U1343 was significantly restricted owing to extensive sea ice during glacial/cold periods, emphasizing the important role in controlling orbital-scale nutrient utilization by diatoms in the slope area of the Bering Sea.