# Collaborative Research: Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea Shelf

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This project will measure new (nitrate) and regenerated nitrogen production directly with tracer incubation measurements in ice-impacted and ice-free regions of the eastern Bering Sea shelf. New production is indicative of the total amount of organic material available for higher levels of the food chain and the ratio of new to total nitrogen production (the co-ratio) indicates the degree to which production is linked to grazing within the water column. This ecological information will be used to characterize the partitioning of primary production between water column and bottom-dwelling consumers and how this changes with conditions on the shelf. The PIs hypothesize that the seasonal development of regenerated production will be closely associated with that of the zooplankton populations and thus the nitrogen productivity data will test a key component of the oscillating control hypothesis that links climate variability to the flow of nutrition through the food web. Community composition will be evaluated in parallel with nitrogen productivity because significant successional as well as year-to-year changes in phytoplankton have been observed on the eastern Bering shelf.

This project also will measure the natural isotopic ratios of both the nitrate supply (both 15N/14N and 18O/16O) and the forms of nitrogen produced (the 15N/14N of suspended and sinking particles, dissolved organic N and ammonium). These measurements provide a passive isotope approach that will reflect the intensity of nitrate assimilation and provide a new constraint on shelf new production. The project will calibrate this new approach against tracer incubation measurements. The passive isotope approach should be particularly useful in quantifying new production in hydrodynamically complex, but ecologically important regions, such as the shelf break, that are difficult to characterize with standard budgets and incubation-based measurements. Finally, the PIs will examine the processes for year-to-year variations of combined nitrogen on the shelf. This analysis will be used to test the hypothesis that variations in physical and biological processes may influence productivity of larger organisms by controlling the amount of combined nitrogen available on the shelf for growth.