Modeling ice-covered marine ecosystem in the Bering and Chukchi seas

A Physical-Ecosystem (NPZD) Model (PhEcoM) was coupled to a Coupled Ice-Ocean Model (CIOM) and applied to simulate seasonal cycle of upper trophic level ecosystem processes with seasonal ice cover in the Bering and Chukchi seas. The simulated circulation pattern and NPZD patterns are consistent with well-known measurements, such as the Green Belt along the Bering Slope Current, which extends to both the Kamchatka Current and the Anadyr Current system. The ice-ocean-ecosystem model can capture well the nutrient-rich Anadyr water and nutrient-poor Alaska coastal water, both of which advect the Bering waters with biologically-distinguished properties into the Arctic Ocean in terms of nutrient, phytoplankton, and zooplankton. Thus, the advection of the Bering waters into the Chukchi Sea would have significant impacts on Arctic ecosystems including food web, in particular, during the period of diminishing summer ice. Seasonal cycle of each compartment in several ecosystem sensitive areas is examined in depth. Sensitivity studies are also conducted to validate some emerging hypotheses.