

Interannual variability of bottom oxygen concentration and primary production in the southern Chukchi Sea biological hotspot

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Hope valley located in the southern Chukchi Sea is known as one of the biological hotspot (southern Chukchi Sea hotspot, SCH). Large benthic biomass in the SCH is supported by high primary productivity of the water column. The dissolved oxygen (DO) sharply decreases at the bottom toward fall as a result of the high sediment community oxygen consumption in the benthic fauna, while it is saturated during winter. We examined annual/inter-annual variability of bottom DO and its mechanisms analyzing ship-board and mooring hydrographic data, satellite derived primary production, and ecosystem model. The bottom DO showed large interannual variability (104–300 μM) and it was negatively and significantly correlated with cumulative primary production ($r = -0.66$, $p < 0.05$). Such negative correlation suggests organic carbon flux to the sea floor drives the activity of the benthic community. Environmental process of decreasing in DO was assessed using one box ecosystem model optimized for the SCH bottom layer. The model also captured bottom DO is sensitive to the flux of primary production from the upper layer. Our results suggest inter-annual variability of primary production is a key factor determining the recent changes in biomass and distribution of the benthic organisms.

Keywords: biological hotspot, primary production, bottom oxygen concentration