Arctic Ocean – ventilation shadow zones in the Siberian shelf seas

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The continental shelf seas of Siberia are productive areas of organic matter transformation, resulting in high nutrient and low oxygen concentrations. The process is influenced by brine production during sea-ice formation and the prevalent ventilation processes on the shelf and along the slope. Both processes are directly responding to the climate change due to changes in the heat budget and sea-ice coverage of the Arctic Ocean. Field data from the SWERUS-C3 expedition in 2014 shows that a patch of high nutrient water extents from 140-180°E along the continental margin and intensifies further east, spreading over a wider depth range. The nutrient maximum east of 170°E is characterized by high salinity of up to 34.5 and an extensive minimum in SF_6 partial pressure suggesting that the water mass is isolated from the boundary current. This water mass shows a nutrient signature of hypoxic conditions, which can be explained by the very slow ventilation and thus long interaction times at the sediment-water interface.

We consciously did not specify any water mass ages with the available tracer data since the analysis of ventilation timescales is difficult to asses in polar regions due to the uncertainty of the transit time distribution (TTD). To specify suitable TTDs and corrections for possible saturation distortion of the dissolved tracers, we are aiming for conducting a joint tracer survey in the Arctic Ocean. This tracer survey is designed to shed lights on the TTD problems by observations of Argon-39 and stable noble gases. These additional tracer data will provide the necessary constraints for the TTD from the surface towards the least ventilated deep basins.