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The Southwestern Okhotsk Sea Paleoceanography - Foraminiferal and Biogeochemical Evidences

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We investigate the sediment biogeochemistry, benthic and planktonic foraminifera in the glacial interglacial sediments of two cores located on the southern and eastern Sakhalin slope at 1265-1370 m water depth within the present Okhotsk Sea Oxygen Minimum Zone (OMZ). We reconstruct the past productivity variations by the accumulation rates of total organic carbon, carbonate, biogenic opal, benthic and planktonic foraminifera. We study the intermediate water mass changes (including variation of the OMZ) by the benthic foraminiferal oxygen indicators and foraminiferal dissolution indexes. The past environmental changes on Sakhalin slope are found to be connected with climatically controlled variations of productivity and ventilation of the Okhotsk Sea Intermediate Water (OSIW, 200-1000 m depth) and the inflow of relatively low oxygenated and calcite unsaturated North Pacific Deep Water (NPDW). These factors determine the development of OMZ on the Sakhalin slope. In the last glacial the foraminiferal assemblage and sediment biogeochemistry document the low productivity alternated by the periods of enhanced OSIW outflow in the MIS2 (Marine Isotope Stage) and calcite unsaturated NPDW inflow in the MIS4-3. The OMZ was weak in the MIS2, when increase of the oxic indicator Cibicidoides group documents more intensive OSIW ventilation. The essential dissolution of foraminiferal assemblages was found in some intervals of MIS3, 16-14.5 (Oldest Dryas) and 12.5-11.5 cal kyr BP (Younger Dryas). These events are likely a combined result of productivity minima and the inflow of NPDW (the modern core at 1700 m depth) which could reach the cores locations (modern water depth 1265-1370 m). The distribution of foraminiferal dissolution intervals corresponds with the timescale of Heinrich events in the North Atlantic that supports a link between the North Atlantic and North

Pacific deep water properties. We suppose that the essential slowdown or shutoff of the North Atlantic Deep Water formation could be responsible for the shallowing of NPDW inflow in the Okhotsk Sea. Our data indicate the first lower peak of productivity at the Melt Water Pulses (MWP) 1A and the second higher maxima of productivity at the MWP1B both caused by two step-like warming of climate and sea level rising. At the MWP1B the OMZ strengthening are reconstructed by the growth of dysoxic Bolivina spissa abundances and associated with maximal productivity and reduced OSIW production. In the Holocene the relatively high organic matter flux and inflow of the low oxygenated and calcite unsaturated NPDW are suggested to be the dominating environmental factors. As a consequence, the benthic foraminiferal assemblage is characterized by low abundances and thus, do not reflect adequately the relatively high productivity as it is documented by the total organic carbon, opal, carbonate and planktonic foraminifera.

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