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Intensification of the oxygen minimum zone in the Okhotsk Sea during the Preboreal interval (11.4-10 ka)

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The Okhotsk Sea is characterized by production the oxygenated Okhotsk Sea Intermediate Water (OSIW: 200-800 m), driven mainly by brine rejection on the northern and western shelves during seasonal sea ice formation. In the Okhotsk Sea, an oxygen minimum zone (OMZ) appears as a layer with oxygen contents 0.3-1.5 ml l^{-1} between 750 and 1500 m water depths mainly because of a combination of high primary productivity, predominant ventilation of the upper 500 m of OSIW, an inflow of oxygen-depleted intermediate water mass from the North Pacific and regional topography. During glacial periods, the intermediate water mass oxygenation appears to have strengthened in the Okhotsk Sea due to increased production of the oxygenated OSIW. The intermediate water mass oxygenation was reduced during glacial terminations and interglacials mainly because of oxidation of a large amount of organic matter in sediments and intensification of the OMZ.

Recently, we reconstructed variations of the Okhotsk Sea OMZ over the last 46-130 ka basing on the downcores changes of the Oxic, Suboxic and Dysoxic benthic foraminiferal indicator groups identified following Kaiho [1] in four sediment cores: LV28-2-4, LV28-43-5, LV28-40-5 and MD01-2415 [2, 3]. The KOMEX cores LV28-2-4 and LV28-40-5 were recovered from the eastern Sakhalin slope at water depths of 1265 and 1312 m, and core LV28-43-5 was taken from the southwestern Kamchatka slope at water depth of 839 m during the V28 cruise of the R/V *Akademik M.A. Lavrentyev* in 1998. Cores LV28-2-4, LV28-40-5 and LV28-43-5 cover 46, 78 and 52 ka, respectively [2]. The IMAGES core MD01-2415 was collected on the northern continental slope at water depth 822 m during the WEPAMA 2001 cruise of the R/V *Marion Dufresne*. A 46.23 m-long sediment core MD01-2415 represents the last 1.1 million years [4]. Benthic foraminifera were investigated in the upper 8.30 m of the core MD01-2415 sediments, which cover the last 130 ka [3].

Our results indicated that during the Preboreal interval (11.4-10 ka) the Dysoxic benthic foraminifera (mainly Bolivina spp.) were widely distributed in sediments between 822 to 1312 m water depths suggesting pronounced decrease of the intermediate water oxygenation and intensification of OMZ in the Okhotsk Sea [2, 3]. It can be estimated that oxygen content near the core sites between 822 to 1312 m water depths dropped by factor two or three in the Preboreal (<0.3-0.5? ml l^{-1} of O_2) as compared to the present (1.0-1.3 ml l^{-1}) [2, 3]. In this study, we summarize our previous data in four sediment cores and discuss probable causes of the intensification of the Okhotsk Sea OMZ during the Preboreal.

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