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Oxygen concentration profiles and the consumption rates at the sediment-water interface off Hachinohe, Northeastern Japan.

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The intermediate waters off Hachinohe (northeastern Japan) signify one of the lowest oxygen (O_2) concentrations in the open ocean around Japanese islands today, indicating below 40μM O_2 between 800 to 1200m water depths due to high seasonal primary productivity at the sea surface. To investigate biogeochemical microenvironments, especially to unravel the relationships and interactions between distributions of benthic organisms and the O_2 distributions where the low O_2 water intersect the sea floor, we conducted a multidisciplinary cruise (KT11-20) by R/V Tansei-maru, JAMSTEC from 21 to 25/Aug/2011. During the cruise, we selected twelve sampling sites offshore from 50 to 2000m in water depth. Dissolved O_2 concentrations 10m above the sea floor at 200, 500, 1000, 1250, and 2000m absolute water depths were 253, 112, 36.4, 33.1 and 70μM, respectively. From 500, 1000, and 2000m sites, undisturbed sediment cores were collected using with a multiple core sampler. O_2 microprofiles in these cores were measured after on board incubations of >7 hours, using an incubator set to the temperatures and O_2 concentrations observed at the sampling sites. O_2 penetration depths at the respective sites at 500, 1000, and 2000m were 1.5-2.8, 3.9-6.8 and 5.0mm respectively, which implies O_2 consumption rates (using the model by Berg et al. 1998) of 2.7-4.2, 0.6-0.7 and 1.4-1.6 mmol/m2/d, respectively. Our results indicate that in O_2 depleted area off Hachinohe, minimum remineralization of organic materials by molecular O_2 diffusion is very low in the area impacted by O_2 depletion (1000m) nevertheless the O_2 penetration depths at the site show deeper values than those from 500m depth.