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# Late Pleistocene–Holocene paleoenvironmental changes inferred from the diatom record of the Ulleung Basin, East Sea (Sea of Japan)

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**Abstract**

The diatom floral record from two piston cores (00GHP-01 and 00GHP-07) taken from the southwestern margin of the Ulleung Basin, East Sea (Sea of Japan) reveals a series of well-defined changes in glacio-eustatic sea level and paleoceanographic conditions during the late Pleistocene–Holocene. Six assemblage zones and two barren zones in 00GHP-01 and four assemblage zones in 00GHP-07 are erected respectively on the basis of frequency of variations in, and occurrences of, biostratigraphically significant diatom species. All assemblage zones have been strongly influenced by the Tsushima Warm Current (TWC). The TWC has an important affect on controlling the distribution and composition of diatom flora, which in turn, reveal the history of the TWC in this area. The distribution pattern of diatoms in the diatom assemblages reveals sea surface temperature and salinity affected by the sediments type and terrigenous material input. Diatom temperature (Td) values show that the site of 00GHP-01 in the Ulleung Basin has been influenced by a relatively enhanced TWC twice during the deposition of lowermost and uppermost intervals. A relatively weak TWC was recorded in the middle interval since the latest Pleistocene. The diatom assemblages of 00GHP-07 represent an apparently continuous Late Quaternary record, spanning the Last Glacial Maximum, Bølling-Allerød, Younger Dyras and Holocene. High abundance of a low-salinity, coastal water diatom *Paralia sulcata* may reflect the influx of the East China Sea water through the Korean Strait to the East Sea (Sea of Japan). During the Last Glacial Maximum, the sea level was low enough that selected basin with shallow sills along the margin of the East Sea (Sea of Japan) became isolated from the Pacific Ocean. Salinity also decreased due to increased freshwater input from rivers draining the surrounding lands. The density-stratified water column may have prevented vertical mixing and resulted in anoxic bottom-water conditions.


*Keywords:* late Pleistocene–Holocene; diatom; paleoceanography; Ulleung Basin; East Sea (Sea of Japan)

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## 1. Introduction

The East Sea (Sea of Japan) is a semiclosed marginal sea connected not only with the Pacific Ocean and the Sea of Okhotsk, but also with the East China Sea by four narrow, shallow straits including the Tartarskiy Strait (15 m deep), Soya Strait (55 m deep), Tsugaru Strait (130 m deep) and Korean Strait (140 m deep). The Tsushima Warm Current (TWC), a branch of the Kuroshio Current, enters the sea through the Korean Strait, and then flows out through the Tsugaru and Soya Strait (Fig. 1a). In the Okhotsk and Bering seas, the sill is deep enough to allow the inflow of Pacific Deep Water, whereas the sill in the East Sea (Sea of Japan) is so shallow that the Pacific Deep Water cannot flow into the East Sea (Sea of Japan). Therefore, a special vertical circulation occurs within East Sea (Sea of Japan), and a peculiar water mass called the East Sea (Sea of Japan) Proper Water is formed (Hidaka, 1966).

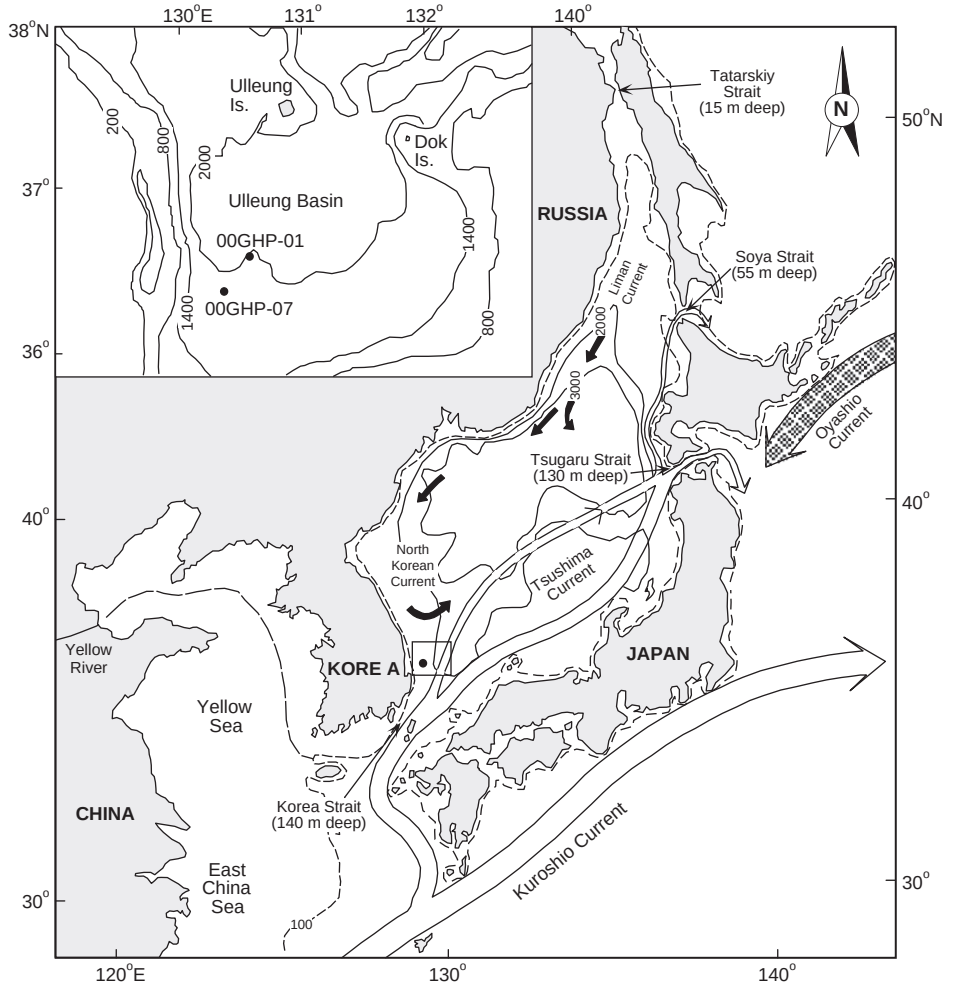


Fig. 1. a: Location map showing the sites of piston cores 00GHP-01 and 00GHP-07 in the Ulleung Basin, East Sea (Sea of Japan) with simplified dominant currents system (modified from Oba et al., 1991). Open arrow (Tsushima Warm Current) indicates high salinity warm current originated from equatorial of western Pacific Ocean. Hatched arrow (Oyashio Cold Current) represents low saline cold current come from the Bering Sea. Black closed arrow indicates cold longshore current along the eastern side of Russia and Korean Peninsula. Inset figure shows the isobath (contours is in meter) and core sites. b: Physiography of the East Sea (Sea of Japan) showing the Japan, the Yamato and the Ulleung basins and other major physiographic features. Contour intervals in meters (modified from Lee and Suk, 1998).