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Variability of the intensity of the Tsushima Warm Current and bottom water ventilation in western North Pacific marginal seas during the Pleistocene: Preliminary results from IODP Expedition 346 (Sites U1427 and U1428) based on ostracod assemblages

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IODP Expedition 346 drilled Sites U1427 and U1428 in ideal locations to monitor changes in (i) the intensity of the influx of the Tsushima Warm Current (TWC), and (ii) the intermediate bottom water ventilation from a few hundred thousand years to over a million years in the western North Pacific marginal seas. Site U1427 is located at 330 m water depth in the marginal sea bordered by the Eurasian continent, the Korean peninsula and the Japanese Islands. This semi-enclosed marginal sea has an average water depth of 1350 m and is connected with other marginal seas in the region by shallow, narrow straits. Site U1428 is located at 724 m in the East China Sea and this region is more influenced by continental freshwater runoff derived from the Yangtze River. Both sites are in the path of the TWC, a branch of the Kuroshio Current, the only warm current flowing into the marginal sea west of Japan. The TWC carries both water originating from the subtropical North Pacific and fresher runoff water derived from East China Sea continental shelf. The northerly flow of the TWC through the shallow Tsushima Strait is ultimately controlled by relative sea level variations over time. The Japan Sea Intermediate Water (JSIW), found below the TWC between 200 and 400-500 m water depth, corresponds to a vertical salinity minimum, and has relatively high oxygen concentration related to the deep-water convection in winter and linked to fresh water supply during winter monsoon intervals. Recent observations point to variations in the intensity of deep and intermediate water currents during glacials and interglacials, and millennial scale climate cycles, but the mechanisms of such variations are not fully known. Here we present preliminary results based on microfossil faunal (ostracods) and sedimentological (sortable silt) proxies that show variability in the intensity of bottom water circulation and environmental conditions during the Pleistocene. Ostracods (benthic microcrustaceans known to react sensitively to changes in water masses physicochemical properties) are abundant in the sedimentary sequences recovered at Sites U1427 and U1428. Sortable silt is the 10–63 μm size carbonate free sediment, known to be an effective tool for estimating the speed of bottom current. We hypothesize that the bottom hydrodynamic regime changed considerably during major climate phases, because of the impact on the intensity of East Asian winter monsoon, TWC and JSIW formation. Our results put in evidence that all these factors affect the bottom ventilation (dissolved oxygen content) and the sediment transport as displayed by the grain-size variation of terrigenous deposits.