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Variability of thermocline hydrography for IMAGES Core MD05-2925 at the southern margin of the Western Pacific Warm Pool during the past 170 ka

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The Pacific Equatorial Undercurrent, mainly originates from the northward transport of the New Guinea Coastal Underwater from the Solomon Sea, has been provoked as a major source to fuel intense primary production in the eastern equatorial Pacific. However, little is known about the glacial-interglacial (G/IG) variability of thermocline hydrographic history in the Solomon Sea. Here we present stable isotopes and Mg/Ca paleotemperature records of surface-dwelling foraminiferas Globigerinoides sacculifer and thermocline-dwelling Pulleniatina obliquilioculata for Core MD05-2925 (9°20.61Ś, 151°27.61É) at the southern margin of the Western Pacific Warm Pool.

P. obliquilioculata is considered to live at the upper thermocline layer, and therefore, its geochemistry proxies reflect hydrological variations of the thermocline through time. The oxygen isotope ratios of G. sacculifer and P. obliquilioculata fluctuated with an amplitude of 2 permil over the last two glacial-interglacial cycles. The carbon isotope ratios of P. obliquilioculata decreased by õ.3 permil during the two deglaciations. The d13C of G. sacculifer decreased õ.2 permil during the Termination I but increased õ.4 permil during the Termination II. The Mg/Ca ratios of G.sacculifer and P. obliquilioculata fluctuate with a range of ĩ.3 and ĩ.1 mmol/mol, respectively, corresponding to a ã and ẽoC change in temperature.

Spectral analyses of d13C and Mg/Ca-derived upper thermocline temperature (UTT) suggest a strong influence of Antarctic on the sub-surface hydrographic changes at this site. UTT reached its highest peak at the beginning of the IG periods, namely, MIS 5e and early Holocene, and decreased rapidly by 3 - 5 oC afterwards. Similar pattern has been reported recently in the Timor Sea at Terminations I and II by Xu et al. (2006 & 2008). The decoupling of surface and sub-surface water in temperature during the early IG periods can be explained by the dramatically thickening of mixed layer and deepening of the thermocline during the second half of the Terminations, assuming that the dwelling depth of P. obliquilioculata did not change much. The good similarity in d18Ow between surface and sub-surface species implies that the stratification is mainly caused by temperature gradient rather than salinity. However, the relationship between the southern high-latitude climate and the sub-surface waters in the WPWP during the G/IG needs further examination.