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Different nature of glacial $CaCO_3$ constituents between MIS 2 and MIS 12 in the East Sea/Japan Sea and its paleoceanographic implication

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Two piston cores (PC-05 and PC-08) were collected on the Yamato Rise in the East Sea/Japan Sea during the KR07-12 cruise. A composite core was achieved with the successful replacement of almost half of the upper part of core PC-05 by the entirety of core PC-08 based on the co-equivalence of L* values and the dark layers, because an interval (170 cm to 410 cm) of core PC-05 was considerably disturbed due to fluidization during the core execution. Chronostratigraphy of the composite core was constructed by the direct comparison of L* values to the well-dated core MD01-2407 that was obtained in the Oki Ridge. The lower-bottom of the composite core reached back to Marine Isotope Stage (MIS) 14, based on the age estimate by LR04 stacks. Downcore opal variation of the composite core exhibited the distinct orbital-scale cyclic changes; high during the interglacial and low during the glacial periods. However, downcore $CaCO_3$ variation showed no corresponding orbital-scale cyclic change between glacial and interglacial periods. Some intervals of both periods were high in $CaCO_3$ content. Frequent and large fluctuations in $CaCO_3$ content seemed to be more related to the presence of dark layers containing thin lamination (TL) within the glacial and interglacial intervals. It is worthy to note that MIS 2 and MIS 12 are characterized by distinctly high $CaCO_3$ content, showing up to 18% and 73%, respectively, among the glacial periods. Furthermore, in terms of lithology, MIS 2 was characterized by a thick dark layer (low L* values) with TL, whereas MIS 12 preserved the distinctly light layer (high L* values) with parallel laminations. Another remarkable dissimilarity between MIS 2 and MIS 12 was the nature of their $CaCO_3$ constituent; the $CaCO_3$ constituent of MIS 2 consisted of mostly planktonic foraminifera, whereas that of MIS 12 was mostly dump of coccolithophorids, regardless the presence of planktonic foraminifera. The distinctness of the $CaCO_3$ constituents between MIS 2 and MIS 12 indicates that the preservation of $CaCO_3$ contents was different temporarily during the glacial periods in the East Sea/Japan Sea. Enhanced $CaCO_3$ preservation in MIS 2 is attributed primarily to less dissolution during the sinking through the water column or at the seafloor, but increased $CaCO_3$ preservation in MIS 12 is mainly due to the high primary production in the surface water. With respect to the different function of the biological pump which controls CO_2 cycles, the East Sea/Japan Sea clearly experienced carbonate-ocean-like state during MIS 12, despite normally silica-ocean-like state.