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# Late Neogene Arctic sea ice history IODP Expedition 302: Arctic Coring Expedition (ACEX) by new non-destructive technology, TATSCANs

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Arctic sea has a great influence on ocean circulation and climate system because sea ice, ice-sheet and iceberg affect a heat budget between atmosphere and ocean and a global thermohaline ocean circulation. Long history of the Arctic Ocean during the Cenozoic era, however, has been unknown from direct evidence. The Integrated Ocean Drilling Program (IODP) Expedition 302 (Arctic Coring Expedition: ACEX) successfully recovered 428m of Cenozoic sedimentary sequence at the Lomonosov ridge in the central Arctic Ocean, 2004.

In order to reconstruct the sea ice, ice-sheet and iceberg history in the central Arctic Ocean, we analyzed the late Neogene sediment cores of ACEX with new non-destructive sediment core scanning techniques, TATSCAN, that is a code name of developing original instruments for non-destructive sediment scanning and imaging on range of millimeter and micrometer scale. The TATSCAN-F2 is an X-ray Fluorescence (XRF) scanner for 2-dimensional elemental imaging of the surface. The TATSCAN-X is another non-destructive scanning technique by using transmission X-ray, which can detect and identify discrete shapes such like isolated granule and pebble in the sediment core. In this study, ice rafted debris (IRD), proxy of sea ice and/or iceberg, was defined as more than 1mm diameter by TATCAN-X.

The variation of IRD increased 0.0-0.8Ma and 1.6-1.75Ma. The IRD increased in the glacial and decreased in the interglacial. It increased high amount of diagenetic

hopanes. On the other hands, the IRD decreases in the intervals of high content of long-chain organic compounds derived from fresh higher plant, which was mainly supplying by river discharge. Considering results of the IRD and diagenetic hopanes variation are same tendency, the IRD should be consisted of terrestrial material.

The downcore variation of manganese content, which was detected by TATSCAN-F2 scanner, corresponded to brownish colored intervals in the sediment core. The manganese content increased in the no or less IRD intervals. The sources of manganese in the sediment will be transported river draining peat and boreal forest from inland or enhanced manganese-deposition under active ocean ventilation.

Consequenstly, ice-sheet expanded from inland to central Arctic sea and separated iceberg rafted and melted at the central Arctic ocean during glacial period, conversely, the ice-sheet decreased and melted, that causes manganese deposition affected by melt water river draining and/or its active ocean ventilation during interglacial.