Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

STT58-P01 Room:Convention Hall Time:May 24 17:15-18:30

A preliminary result of magnetostratigraphy of a sediment core from Chukchi Rise, Arctic Ocean

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Elucidation of climate changes in the Arctic Sea has gradually been regarded as important since 1960s when geological surveys commenced in the Arctic region. The sea has a unique marine environment with poor bioproduction and high resolved carbon dioxides, resulting that the sea bottom sediments have a unique biostratigraphy and isotope stratigraphy. Before 1980, accumulation rates (a.r.) of the Arctic Sea sediments were estimated to be several mm/ka or less based on magnetic polarity stratigraphy. As a result, the Matuyama-Brunhes boundary was often estimated to lie at ˜1m below seafloor. However, radiocarbon dates and biostratigraphy obtained after 1980s revealed that a.r. was as high as several cm/kyr all over the Arctic ocean. The new a.r. revised the former interpretations that reverse polarity chrons/subchrons could be correlated to the short reverse polarity intervals observed in the Arctic Ocean and Norwegian-Greenland Sea cores. The short intervals are now correlated with excursions during the Brunhes Chron. Recently, excursion stratigraphy is often used for dating Arctic cores.

Sediment cores were collected in 2009 at the Chukchi Rise in the Arctic Ocean during the JAMSTEC cruise MR09-03 whose objects are environmental changes of temperature, hydrological cycle, bioproduction and distribution of sea-ice. The core sites are located at different water depths between 74 degrees 26 minutes N and 75 degrees 28 minutes N and from 165 degrees 40 minutes W and 165 degrees 44 minutes W. This study aims at elucidation of paleoenvironment in the Arctic Ocean. We used core PC01 and pilot core PL01 collected at a 558 m water depth on the west slope of the Chukchi Rise (75 degrees 28 minutes N, 165 degrees 40 minutes W). As the first step, a paleomagnetic investigation was conducted to establish magnetostratigraphy for dating.

237 cubic specimens were collected for magnetic measurements. Natural remanent magnetizations were measured using a super-conducting magnetometer. All the specimens were subjected to alternating field and thermal demagnetizations. Characteristic remanent magnetizations (ChRM) were calculated using principal component analysis. The result shows that normal polarity ChRMs are dominant throughout the core except some parts. Negative inclination zones are found at 77.3-79.3cm, 164.3-186.8cm, 210.6-220.1cm, 251.1-265.4cm. These may be excursions. We will conduct rock magnetic analyses to confirm that they are real geomagnetic phenomena. Using photoluminescence and radiocarbon dating results that will be obtained in near future, we finally establish excursion stratigraphy.

Keywords: Magnetostratigraphy, Excursion, Arctic Ocean