PRELIMINARY REPORT ON DARKHAD DRILLING PROJECT 2010-2014 AND INTRODUCTION OF ON-GOING JOINT PROJECTS

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Introduction

The Darkhad (Darhad) Basin is located in high plateau of Mongolia, west to Lake Khuvsgul (Hovsgol) bounded by high mountain range of ~3000m above sea level. Both of Lake Khuvsgul and Darkhad Basin situate in Baikal Rift zone (ref), and formed by the extension of the area. Because of their remote location and thick sediments deposited on the deep lake bottom, which is typical of tectonic lakes, these basins, together with lake Baikal, are one of the best fields to study past climate changes by analyzing sedimentary cores. The Darkhad Basin was filled with water, which is deduced from the distribution of paleoshorelines and thick lake deposits in the Basin (Krivonogov et al., 2005). The reason why water outlet (Shishhid Gol) was dammed to keep water in the basin is still under the debate, but damming by the glacier is widely accepted. Because the basaltic lava distributed around the outlet of the Shishhid Gol, damming by the lava is also considered. When ice dam was failed, the mega flood must have attacked the lower reach of the Shishhid Gol (O'Connor and Costa, 2004). In 2010, additional three sediment cores are recovered by the Darkhad Drilling Project Members near Lake Dood Nur for the purpose of reconstructing history of Darkhad Basin (or Darkhad paleo lake) and paleoclimate. This study reports preliminary data for these three cores. Together with the Research in Darkhad Basin, the paleoenvironmental researches are going on in Terkhin Tsagaan

Lake. Small lakes suitable to observe modern terrestrial process are under the search for the purpose of understanding the mechanism to produce the fluctuation found in lake core samples.

Drilling site in Darkhad Basin

Three cores were recovered from northern part of Darkhad Basin, east of Lake Dood Nur. The northern part is close to outlet Shishhid Gol, therefore, there is a possibility that the sediment in the north records the outburst event caused by the dam failure more effectively. Three cores are arranged in west-east transect, hoping to understand the sediment transport process from the eastern mountainous range through basin to the outlet.

Drilling operation was performed in the spring of 2010 by the Mongolian, Korean and Japanese project team. Core recovery was around 70 %, though the percentage of sediment samples is less because of significant amount of ice in the upper part (Permafrost zone). Cores were cut into half at the drilling site middle of the grass field, and described. Half of the core was then cut every 3 cm. Remaining half cores were stored in the cool subsurface storage. In the following two years (2010 and 2011), sampling using U-channels and plastic cubes were carried out on these remaining half cores. Then some samples were exported to Korea and Japan for analyses.

Analyses applied to core samples

For all three cores, whole rock grain size distributions were measured with a laser refection analyzer at Kanazawa University. 14C ages are obtained at several horizons on samples of shell, wood

fragments, or total organic carbons by Tandetron Accelerator Mass Spectrometry system at Nagoya University. The longest DDP10-3 core was further analyzed by several techniques. Pollen assemblages were observed at Kyoto Prefectural University. The amounts of total organic carbon and nitrogen were measured at Kanazawa University by Mongolian colleagues. Mineral assemblages were measured by x-ray powder diffraction at Kanazawa University. Photosynthetic pigments included in sediments, originated from algae or phototrophic bacteria, were analyzed at University of Shizuoka. Paleomagnetic analysis was carried out at Toyama University.

Lithology of cores from Darkhad Basin

The lowest of three cores consists of thick sand layer, which prevent further drilling. The eastern core shows coarse facies in general. The sediments were originated from the eastern mountain range and transported from east to west. Facies changes between three cores are consistent to this transportation processes. Many sand layers are incorporated and paleomagnetic polarity become less reliable for these sand layers. Therefore, establishment of magnetostratigraphy was difficult. Base on the lithology and chronology of the core, which is deduced from magnetic data, 14C data and pollen data, the extreme lake level change must have occurred at least a few times in these 100krs. When we analyzed on-land lacustrine sediment near Terkhin Tsagaan lake and a <1m core from Terkhin Tsagaan lake, we found the possible of lake level change in this area. Mongolia situates middle of continent and its environment is sensitive to changes and is a superb field to understand past climate changes.

Krivonogov et al., 2005: Stages in the development of the Darhad dammed lake (Northern Mongolia) during the Late Pleistocene and Holocene. Quaternary International 136, 83–94.

O'Connor and Costa, 2004: The World's Largest Floods, Past and Present: Their Causes and Magnitudes. USGS circular 1254, 13p.

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