Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

HQR24-P05 Room:Convention Hall Time:May 23 18:15-19:30

Reconstruction of the recent flood history from oxbow lake sediment, Ishikari Floodplain, northern Japan

Yuji Ishii[1*], Kazuaki Hori[1]

[1]Graduate School of Environmental Studies, Nagoya University

Oxbow lakes are often observed in meandering river systems. Oxbow lakes are formed when a meander loop get cut off from the main stream. After initial cutoff event during a flood, plug bars are formed quickly at the channel entrances. Ultimately, an abandoned meander can become a disconnected oxbow lake in the floodplain. The channel fill deposits generally show a fining upward trend (Toonen et al. 2012), and this is autogenic processes. But, they may contain the sedimentary record influenced by allogenic processes. It is possible to reconstruct the recent flood history by analyzing the core sediments in detail.

The purpose of this research is to understand the sedimentation history in the oxbow lake since it has been formed. A core (called the TK core) was taken at the thalweg of the Tuki Lake in the Ishikari Floodplain. We conducted ^{14}C dating on plant materials to estimate sediment accumulation rate. Additionally, the ^{137}Cs content of the TK core were measured at 4 cm intervals. TK core was analyzed at c. 2.2 cm intervals for water content (WC), grain size, and loss on ignition (LOI) and at 2 cm intervals for color parameters L*, a*, and b*.

Borehole sediments can be divided into six depositional units from bottom to top of the core on the basis of various physical properties and sedimentary facies. Details of the depositional units are described below.

Unit 1 (depth in core: 11.8-10.8) is composed of sand and gravel. Although the radiocarbon age is not obtained from Unit1, the unit occurs at almost the same depth of the basal gravel found in the other cores located near the TK site. The age of 650-560 cal BP was obtained from a plant fragment (depth in core: 10.3 m) in Unit 2. This sand and gravel layer may contain younger strata than the basal gravel.

Unit 2 (depth in core: 10.8-10.1 m) mainly consists of sandy silt. Unit 2 shows lowest WC and LOI in TK core except for the Unit1, and WC is approximately 25% and LOI is around 5%.

Unit 3 (depth in core: 10.1-10.0 m) is characterized by clay with high organic content. WC is about 35-55% and LOI is around 10-20%.

Unit 4 (depth in core: 10.0-5.0 m) mainly consists of silt. LOI fluctuates between approximately 5 and 10%. Four layers composed of very fine to fine sand are thickly interbedded at 6.0-5.0 m depth in core and the thickness of each layer is around 3-10 cm.

Unit 5 (depth in core: 5.0-2.3 m) is characterized by upward increasing of WC from approximately 35% to 45% throughout the unit. In the lower part of the unit (5.0-4.5 m depth in core), grain size show upward fining from 7 phi to 8 phi. Grain size show approximately 8 phi in the upper part of the unit (4.5-2.3 depth in core). LOI is stable around 9% as a whole.

Unit 6 (Depth in core: 2.3-0 m) shows upward increasing in LOI and WC. In particular, LOI in the middle of the unit (1.3-0.8m depth in core) is very high. The peak of magnetic susceptibility is observed at 1.8 m depth in core. This is probably correlated to Tarumae-a tephra (Ta-a, AD1739).

We are able to estimate sedimentation rate using ^{14}C ages. Average sedimentation rate are approximately 70 mm/yr through Unit 2-Unit4, and 8 mm/yr through Unit 5-Unit6.

The 1963 peak ^{137}Cs concentration was probably detected at the depth of 92-93 cm. Therefore, sedimentation rate are 19.4 mm/yr in AD1963-present (0.93-0 m depth in core).

TK core generally show upward fining trend as a whole, but four sand layers are not subject to the trend. These sand layers may suggest large flood events. Additionally, the increased LOI in upper part of the Unit 6 (depth in core: 1.3-0 m) is human-induced, and the sedimentation rate is also increased with this change.

Keywords: oxbow lake, lake sediments, reconstruction of flood history, Ishikari River, Holocene