Variation of climate and atmospheric circulation over the 40 ka: evidence from sediments of Lake Suigetsu and Lake Biwa

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We attempt reconstructing of climate and atmospheric changes over the last 40 ka in East Asia, through the systematic analytical methods (for example XRD) of lake sediment cores of Lake Suigetsu and Lake Biwa.

As a result, it is possible not only to reconstruct annual to decadal paleoenvironmental changes but to detect the large and abrupt environmental (climate, sea-level and atmospheric circulation) changes in E.Asia by using lake sediments. In paticular, global cooling events as Younger Dryas have been recognized in the atmospheric circulation change in E.Asia. Furthermore the trigger of global climate change might be atomospheric circulation change inmid-latitude area (including E.Asia) by making a comparison between high latitude climate with E.Asia one.

Paleoclimate studies have revealed the millennial-scale large and abrupt climatic change in the high latitude region of the Northern Hemisphere , so-called Dansgaard - Oeschger Cycles and Heinrich events, during the last glacial in Greenland ice cores and in North Atlantic sedimentary records. Such short timescaled climatic changes have been recognized elsewhere as a global climate change. However, it is not clear that the change of atmospheric circulation and wet - dry climatic conditions in the East Asia region in terms of short timescaled climatic changes.

So, this present study is a attempt to clarify eolian dust flux, precipitation, wet - dry climatic condition and sea-level since late Pleistocene using the lake sediments in the East Asia region. The purpose of this attempt are to reconstruct paleo Asia monsoon activities and sea-level changes along the Chinese Continent - the Japan Sea - the Japan islands transect and to compare with the global climatic changes.

Using the non-glacial varved sediments (SGP2, 3, 4) over the last 15,500 yr at Lake Suigetsu of central Japan, and the lake sediment (BIW95-4) over the 38,000 yr at Lake Biwa of central Japan, this present study have systematically done analytical methods such as X-ray powder diffraction, color refrectance, magnetic susceptibility, total organic carbon measurement.

Illite and quartz fluxes in lake sediments are very useful proxy of paleo winter monoon activity and westerly intensity, and they refrect global atmospheric circulation changes.

And Organic carbon accumulation rate in lake sediments influenced the amount of inflow through rivers into lake is a useful proxy of paleo precipitaion, and terrestrial wet-dry climatic condition as well.

The results can be summarized as follows:

1) It is recognized that large and abrupt cold, dry climate and low sea-level periods during the deglaciation in varved sediment in Lake Suigetsu, and these periods are correspond to Younger Dryas and Older Dryas. Also, it is cleared that the atomspheric circulation changes in East Asia go ahead of terrestrial climatic changes . Atmospheric circulation and sea-level change are well synchronized during the Holocene

2) It is recognized that the millennial-scale large and abrupt climatic change in Lake Biwa sediment. Particularly, Heinlich(H1-H4) and 8.2ka events are recorded in it. This is suggested the existence of tele-connection by atmospheric circulation between the North Atlantic region and East Asia region.

3) Climatic changes between China and Japan are dissimilar during the Holocene compared with the last glacial. The reason for this cause may be the influence by ocean circulation than atmospheric circulation.