Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

APE031-26 会場:104 時間:5 月 26 日 11:00-11:15

エジプト、カルーン湖における完新世堆積環境変化
Changes of sedimentological environment during the Holocene in Lake Qarun, Faiyum Basin, Egypt

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Faiyum Basin, which is a big depression, connected to the Nile Valley via a lateral distributary and 70km from Memphis, the ancient Egyptian capital. Lake Qarun is located at the north end of the basin. The Lake is 40 km in length, 5.7 km in width and 43 m below sea level with a mean and maximum depth of 4.2 and 8.4 m, respectively. There is no outflow river from the lake at present, thus retaining the saline water environment due to high evaporation in summer. The salinity of the lake water is almost the same as that of sea water (Flower et al., 2006).

We attempted to recover continuous sedimentary records over the Holocene in order to reconstruct the geographical history of the lake, which were influenced both by climate changes and anthropogenic impacts possibly due to an ancient Egyptian civilization.

Sediment coring was undertaken in 2008 and 2010. A total of three sediment sequences were recovered within three km in distance. Faiyum08-1 core was 20.35 m in length, taken from the southern part of the lake shore. QRN10-1 and 02 cores were 28.25 and 18.00 m, respectively, taken on the lake. The site of QRN10-1 core is closer to a small river mouth than that of QRN10-2 core.

The lithology and stratigraphy were quite well correlated with each other. The chronology obtained from multiple radiocarbon dates and varve counting suggests that the sediment sequence is almost continuous since the 10,000 calBP years ago. These allow us to establish the history of the sedimentological environment during the Holocene, in relation to the lake level fluctuation.

The sedimentological sequence was classified and interpreted as below:

1- Pleistocene beach and fluvial sand deposition (before ca. 10,000 calBP)

Well shakeout of fine to medium rounded sand particles were deposited with shell fragments.

2- Yellowish thin laminated (varved) lacustrine mud (ca. 10,000 to 9,000 BP)

Thin alternations of white diatomite and yellowish mineralogenic layers were deposited. Dominant diatom assemblages in the white layer were Aulacoseira granulate and Stephanodiscus, suggesting that the layers were formed in winter. Yellowish mineralogenic layers deposited during dry seasons in summer.

3- Dark greyed thin laminated (varved) lacustrine mud (ca. 9,000 to 5,000 BP)

Thin alternations of white diatomite and grey mineralogenic layers were deposited. Dominant diatom assemblage in the white layer was Aulacoseira granulate, suggesting that the layer was formed in winter. Grey layers deposited during dry seasons in summer. The difference of the sediment colors in 2- and 3- may reflect the changes of source materials from the Nile. The former is originated from the White Nile (mainly quartzite), the latter is from the Blue Nile (mainly volcanic materials as Basalt).

4- Grey homogenous mud (5,000 to 2,000 BP)

Generally greyed homogenous mud deposited with remarkable diatomite thick layers. In some parts, it was identified intercalated gypsum crystal and iron-oxide thin layers.

It is suggested to start shrinking the lake with a large fluctuation due to high evaporation with dry climate condition.

5- Brownish homogeneous mud / deltaic sand deposition (after ca. 2,000 BP)

Generally, brownish homogeneous mud was deposited with pottery fragments. Also, fine to coarse sand with cross bedding was observed particularly in QRN10-1 core, indicating the development of channels into the lake. This sedimentary environment is similar to modern condition.

Thus, the sedimentological environment in Lake Qarun over the Holocene was reflected by lake level changes, and mostly coincides with the geomorphological data in the Basin (Hassan, 1986). Our new findings were as follows: a drastic and major Nile flood occurred at the beginning of the Holocene (9,935 +/- 230 calBP). The flood could be the first one in this region, and may have caused an intrusion of fresh water immediately fulfilled the basin (at least 15 years) as well as the sapropel in the eastern Mediterranean (Calvert and Fontugue, 2001).