Geophysical Research Abstracts
Vol. 16, EGU2014-5596, 2014
EGU General Assembly 2014

Characterization of magnetic spherical fractions in sand deposits for interpretation of environmental change around the El- Zayyan temple, Kharga Oasis, Western Desert, Egypt

Makiko Watanabe (1), Natsuko Koizumi (1), Sayuri Kato (1), Ryohei Kikuchi (2), and Hiroyuki Kamei (3)

(1) Tokyo Metropolitan University, Department of Geography, Hachiohi, Tokyo, Japan (m.wata@tmu.ac.jp), (2) Tokyo Institute of Technology, Center for Advanced Materials Analysis, Tokyo, Japan, (3) Tokyo Institute of Technology, Museum, Tokyo, Japan

Desertification in North Africa has rapidly advanced over the last 6,000 years. Such environmental changes began in the Early Dynastic Period of Egypt (4200 - 3150 BC), and the occupation of Achaemenid Persian and Roman cultures in Egypt occurred under even drier climates.

Kharga is the largest oasis of the five oases, located in the western desert of Egypt that contains a treasure trove of archaeological resources. This oasis has been highlighted to promote resource exploration and development of archaeological tourism since the 1980's. The El-Zayyan temple is located 27 km south of the central Kharga oasis. Zayyan was once called "Tchonemyris", which has connection with the means of 'huge well' in Greek. Although major portions of the temple were rebuilt in 140 AD during the rule of the Roman Emperor Antoninus Pius, this temple is considered to be originally built in the Ptolemaic period (4c-1c BC). It is likely that the area had a sufficient water supply in the past as the El-Zayyan temple stands at the lowest point (-18 m a.s.l.) in the Kharga oasis. Furthermore, the El-Ghueita temple that stands on a hill top at 68.5 m a.s.l., 4 km northward from the El-Zayyan temple, has given name that means 'beautiful garden' in Greek. From these facts, we can imagine that the past landscape of this area contained green surroundings. The El-Ghueita temple was well known as a production centre of high quality wine since the mid-Dynastic age (2050 -1786 BC). As this area is currently arid, it is expected that there were irrigation facilities to maintain the vast farm land during the ancient period.

To deepen our knowledge of how people developed their technologies and conducted their life within the natural environment of a drastic drying period, understanding the process of environmental change on a region scale is necessary. The aim of this study was to extract proxies from sand deposits in the western desert area to estimate the change in the environment. We examined the sand layers with a focus on the spherical magnetic fractions having relations with accumulation of free iron oxides, condition of water and microbial activities.

The study sites were located west of the El-Zayyan temple, and six and seven samples were collected every 10 cm from the two sand profiles, Zy-R and Zy-6, respectively. AMS 14C dating was conducted using fine fractions of an organo-mineral complex; date ranges 5,000-8,400 yBP and 5,500-7,800 yBP were assigned to Zy-R and Zy-6, respectively. Spherical fractions, separated into six colored-types, were extracted using a neodymium magnet, and then characterized by SEM observation, EDX elemental analysis (FE-SEM S4700, Hitachi, Genesis, EDAX), and X-ray micro-crystal structural analysis (D8-Discover, Bruker axs) to discuss their origins. The vertical change in the density of each fraction by weight and counts in sand revealed the environmental change.