

Luminescence dating of lacustrine lowland sediments around Lake Kasumigaura

*Kazuki Haneta¹, Kazumi Ito², Toru Tamura², Naofumi Yamaguchi³

1.Graduate School of Science and Engineering, Ibaraki University, 2.Geological Survey of Japan, AIST, 3.Center for Water Environment Studies, Ibaraki University

Lake Kasumigaura is a coastal lake in southeast Ibaraki Prefecture, and has lacustrine lowland formed in response to sea-level changes around its lake shoreline. While several studies have been conducted to explore the formative processes of the lowland which is critical for understanding of the paleoenvironment, little is known about absolute age of the lowland sediment. In this study, we applied luminescence dating to the lowland sediments of Lake Kasumigaura.

Nine sediment cores were obtained using a 2-m-long geoslicer in lacustrine lowland at Gochoda, Namegata. Six sediment samples were then taken from selected cores for the luminescence dating and processed in subdued red light. The samples were sieved and treated with chemicals to extract the 120-250 μm quartz and K-feldspar fraction. In preliminary measurement, we found that the quartz OSL signal is dominated by component unsuitable for dating, and thus decided to carry out K-feldspar IRSL and post-IR IRSL (pIRIR) protocols for equivalent dose (D_e) estimation. As a result of several test, the preheat and cut heat temperature of 200°C, hot IR breach of 205°C were suitable to measurements. As the lowland sediment is expected to have Holocene age according to previous studies, we used a relatively low pIRIR stimulation temperature, 170°C, which is known to be suitable for young samples. The bleaching and fading tests of pIRIR showed that the residual dose was about 1 Gy, and that the g-value was about 0-1 %/decade, respectively. Thus, for the age estimate of pIRIR, the residual dose should be subtracted from the D_e estimate while no fading correction is required. The IRSL in contrast showed considerable anomalous fading; its g-value was around 10%.

It was revealed the both of pIRIR and IRSL result that D_e tend to be higher with increasing depth at a single core site. The largest D_e of pIRIR was about 50 Gy from the deepest sample of the core nearby the Pleistocene terrace. Other samples showed D_e s ranging from 1 to 15 Gy. We will consider radionuclide concentration quantified by inductively coupled plasma mass spectrometry for the determination of the environmental dose rate and then calculate the pIRIR and IRSL ages. We will also compare the age estimate with ¹⁴C age.

Keywords: OSL dating, pIRIR dating, Kasumigaura, lacustrine lowland