聚楽土の磁気特性：相国寺境内発掘調査地における予察的検討

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Magnetic properties of the Juraku-tsuchi soil: preliminary results from the Shokokuji Temple precinct excavation site

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The Juraku-tsuchi is earthen plaster used for clay walls of traditional Japanese buildings. Although its original material is mined from sub-surface deposits mainly around the ruins of the Jurakutei Palace in Kyoto City, the distribution, age and depositional environment of the deposits remain unclear. During the archeological excavation in the Imadegawa Campus of Doshisha University in 2010-2011, a yellowish brown sandy mud layer resembling the Juraku-tsuchi was found intercalated in fluvial sand and gravel deposits. Although exact chronological data has not been obtained yet, it is suggested that the sequence was deposited as a fluvial fan forming ground surface of the classical capital city, Heiankyo. We investigated magnetic properties of the muddy deposit including natural remanent magnetization (NRM), anhysteretic remanent magnetization (ARM), low-field susceptibility and its anisotropy (AMS).

Oriented block samples were collected from eight horizons in the sandy mud layer of about 1.4 m thick and divided into 3 to 8 cubic-shape specimens of 10 cm3 for magnetic measurements. Measurements of NRM and alternating field (AF) demagnetization made on a cryogenic magnetometer (2G Enterprises 755R) showed that most specimens contain unstable overprint demagnetized below 25 mT and stable magnetization linearly decaying from 30 to 100 mT. Directions of the characteristic magnetization, calculated by principal component analysis of the stable component, showed good concentration in each block, although the top most samples showed dispersed shallow inclinations. The topmost sample was also characterized by anomalous AMS data suggesting mechanical disturbance by the overlying artificially modified surface soil layer. The overall mean direction of the seven horizons was close to the expected geomagnetic field direction at Kyoto and can be assumed representing the past geomagnetic field at the time of deposition.

Measurements of low-field susceptibility by using a Bartington MS2 susceptibility meter with a MS1B sensor at 0.47 and 4.7 kHz revealed frequency dependence of from 3 to 8%. The correlations of the susceptibility at 4.7 kHz with the high-frequency loss and with the ARM intensity suggested existence of superparamagnetic particles, which are commonly found in modern soil and paeolsol deposits. This result suggests that the mud deposits had suffered soil development during depositional process from weathering through the deposition.