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An application of facies analysis and tsunami deposit investigation using X-ray CT images of the boring cores

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Introduction: As a part of tsunami deposit investigation (Shimada *et al.*, 2012, this session), the boring survey was carried out in the lake Kugushi, central Japan. Four boring points (KG11-1 to KG11-4, from north to south) were set along N-S direction and another one (KG11-5) was placed in SW part of the lake. We discuss the transition of sedimental environment after the Heian Period within 1m thicknesses of the cores and the existence of the evidence for the large tsunami generated by the Tensho earthquake, occurred at AD 1586.

Regional settings and methods: The Mikata-goko area is located in subsidence side of the Mikata fault (N-S strike, E dip). The blackish lake Kugushi has N-S major axis and connects to Wakasa bay by the river cutting beach ridge in northern part of the lake. Main source of sediment supply into the lake was the old-Kiyama river along the Mikata fault before the Kanbun earthquake, occurred at AD 1662. The old-Kiyama river was closed due to uplift by the earthquake, and the main source was altered to an artificial canal through another lake. The old-Kiyama river delta remains in southern part of the lake Kugushi.

Facies analysis based on observation of the cores by eyes and X-ray CT images, and 14C dating was operated.

Results: As a result of the facies analysis, the bed is classified into three groups, III, II and I from lower to upper. The bed III, which mainly consists of organic fine silt, shows uniform grain size distribution in macro scale, but contains thin units typically composed of a pair of an erosion surface with clastic mud overlied by graded silt. The bed II mainly consists of highly bioturbated organic coarse silt and contains granule-sized clast. The bed I mainly consists of organic-rich fine silt and contains shell fragments.

Mean sedimentation rate are 0.5m/ka (KG11-1 and KG11-5) and 0.8m/ka (KG11-2, KG11-3 and KG11-4), based on the obtained 14C ages.

Sedimental environment: The bed III is interpreted to represent the deposits of quiet lake. The coarse-grained units are interpreted as the deposits of minor river flood. The bed II is interpreted to represent the deposits of prodelta. Upward coarsening from the bed III to the bed II and high sedimentation rate (see below) suggest progradation of the old-Kiyama river delta. Dominance of bioturbation suggests activation of the bioactivity as a result of shallowing of the lake. The bed I is interpreted to represent the deposits of quiet lake.

The sedimentation rate of the bed II are about 0.4m/ka (KG11-1), 1.6m/ka (KG11-2 and KG11-3) and 0.8m/ka (KG11-4 and KG11-5). These differences probably depend on influence range of the old-Kiyama river flow. The assumed sedimentation rate of the bed I is low in each core (about 0.1m/ka to 0.4m/ka).

The acceleration of the sedimentation rate through the bed III and the bed II, is thought to be artificial effects in the Heian Period. The 14C ages around the boundary are Cal AD 540-620 (KG11-1), Cal AD 780-980 (KG11-2), Cal AD 890-1020 (KG11-3) and Cal AD 890-990 (KG11-5). The deceleration of the sedimentation rate through the bed II and the bed I, is thought to be decrease of the sediment supply by the uplift of the old-Kiyama river. The 14C ages around the boundary are Cal AD 1150-1260 (KG11-1), Cal AD 900-1030 (KG11-2), Cal AD 1290-1410 (KG11-4) and Cal AD 1700-1920 (KG11-5).

The Tensho earthquake: Some historical records mentioned the large tsunami attacked the Wakasa Bay area at the Tensho earthquake. If it was true, the evidence should remain beneath the boundary of the bed II and the bed I. But, no clear erosion surface or coarse-grained deposits can be detected by analysis of high-resolution X-ray CT images (0.5mm pitch: correspond to 0.5~1.0yr) at the horizon. Thus, the evidence of large tsunami as mentioned in the historical records is not recognized.

Keywords: lake deposit, boring core, X-ray CT image, tsunami deposit, infrequent gigantic tsunami