Crustal movements inferred from fossil diatom assemblages during the last 1000 years, in the lower reaches of Toberi river area, Taiki, iHokkaido, Japan

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The details of paleo-sea level changes and paleo tsunami deposits have been studied, and also discussed about the paleo seismology along the Kuril Trench in the pacific coast at eastern Hokkaido, Japan (e.g. Nanayama et al. 2003, Sawai et al. 2004). As a result of these studies, the history of multi-segment earthquakes (M 9 class) have been revealed. The average recurrence interval of multi-segment earthquakes is estimated to be 400–500 years and the latest earthquake occurred in 17th century. However, the extent of the tsunami and the crustal movements due to the 17th century multi-segment earthquake are still unclear in westward of the eastern Hokkaido.
Nature-looking view and vast marsh are keeping relatively in lower reaches of Toberi river, at eastern Hokkaido, Japan, so volcanic tephras due to the series of volcanic eruptions (e.g. Mt. Komagatake, Tarumae and Usu) during 17th century and some tsunami deposits are well preserved in the marsh deposits (Nanayama et al. 2003, Furukawa and Nanayama 2006). However, few studies have been done to investigate the paleo-environmental change including the tectonic movements in this area. In order to reveille the tectonic movement due to the great earthquake occurred along the Kuril trench, we conducted GPS and geoslicer survey in lower reaches of Toberi river. Moreover, we analyzed fossil diatoms in the 83 cm long core sample obtained from 1.2 km landward from the coast.
As a result of field survey, the range of elevation was 1.3–7.5 m in study area, and we recognized a sand deposit show landward-thinning and extend to 1.4 km inland area in peaty deposits. In addition, the environmental change during the last 1000 years was inferred from changes of diatom assemblages and ages of tephras. We recognized the two major changes of diatom assemblages by the cluster analysis. The first is freshwater species change recognized in upper peaty and muddy deposits (0-30 cm depth). It is possible that the change caused by the land-use changes in upstream side of Toberi river and the river channel change in 19-20th century. Second is the change of relative abundance in freshwater, freshwater-brackish and brackish-marine species in lower peaty, muddy and sandy deposits (40-83 cm depth). The diatom assemblage showed a gradual increase of brackish-marine species prior to the deposition of sandy deposits and gradual decrease of these species posterior to the deposition before deposition of AD 1663 Us-b tephra. It is presumed that the changes of diatoms in lower peaty deposits were refraction of the relative sea level changes due to the inter-seismic, co-seismic or post-seismic crustal movements by great earthquakes along the Kuril Trench in 17th century. It suggests the possibility that the pattern of crustal movement recognized in this study is similar to the movement pattern in the area from Akkeshi to Nemuro (Sawai et al. 2004).

Keywords: Toberi river, Tsunami deposit, Fossil diatom assemblage

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