

Characteristics of tsunami deposits and crustal movements estimated from fossil diatom assemblages during the late Holocene, in the lower reaches of Toberu river area, Hokkaido, Japan

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In order to reveal the characteristics of tsunami deposits and crustal movements during the last millennium, in the Tokachi coastal area, Hokkaido, Japan, we conducted Geo-slicer and GPS survey in 17 sites at the lower reaches of Toberu river area. We observed the lithology of all core samples obtained by Geo-slicer and fossil diatom assemblages in the two cores (T58 and T35) were analyzed. Elevation of T58 and T35 were 2.44 m and 2.25 m respectively. Three or Four tephras corresponded to Ta-a (AD 1739) Ta-b (AD 1667), Us-b (AD 1663), and B-Tm (ca. AD 1000) were recognized in almost all of cores. Two mud or sand layers were recognized in the muddy peat or peat layers between Us-b and B-Tm. The upper and lower event deposits corresponded to the tsunami deposits due to the great earth quake occurred along the Kuril subduction zone in the 17th century and 12–13th century respectively. The upper event deposit extended 1.4 km from the modern coast line, and showed the thinning trend, decreasing trend of sand contents and increasing trend of diatom valves towards the inland distribution limit. Moreover, brackish-marine species in the upper event deposit increased and freshwater diatoms conversely decreased to the landward from the seaward side. On the other hand, the environmental changes during the last millennium were inferred from the changes of the diatom assemblages in the muddy peat or peat layers above B-Tm tephra. Freshwater-brackish species gradually increased in relative abundance in the diatom assemblage before the deposition of the event deposits and then gradually decreased after the deposition. The decreasing trend of freshwater-brackish species also continued after the deposition of the Ta-b tephra in AD 1667. We surmise that the diatom species change in the muddy and peaty deposits reflect relative sea level changes caused by inter-seismic or post-seismic crustal movements associated with great earthquakes along the Kuril Trench in the 17th and 12–13th centuries. Moreover, it is revealed that Tokachi area now uplifts about 3 mm/year from tide gauge record at Tokachi harbor (Coastal Movements Data Center 2018). The changes of diatom assemblage after the deposition of Ta-b tephra in AD 1667 suggest that the possibility of environmental changes corresponding to the crustal movements after the 17th century earthquake event.

Keywords: Tsunami deposit, Crustal movement, Diatom assemblage, Hokkaido, Tokachi area