Inter-seismic and post-seismic tectonic movements detected during the 17th century earthquake and inferred from diatom analysis in Tokachi area, Hokkaido, Japan

*千葉 崇[1]、西村 裕一[2]
*Takashi Chiba[1], Yuichi Nishimura[2]

1. 秋田県立大学生物資源科学部、2. 北海道大学理学研究院
1. Faculty of Bioresource Sciences, Akita Prefectural University, 2. Graduate School of Science, Hokkaido University

It has been evidenced from geological records that paleo-earthquakes accompanied by huge tsunamis occurred at least twice in the last millennium at the southern part of the Kuril Trench. The first of the two tsunamis is supposed to have occurred in the 12-13th century, while the other is supposed to have occurred in the 17th century. The paleo-earthquake and successive tsunami of the 17th century have been particularly investigated by previous studies in the area between Akkeshi to Nemuro at the Hokkaido, Japan. However, the crustal movements due to the earthquake in the area at western side of the Akkeshi such as Tokachi area is still unknown. This lack of substantive information is an obstacle for the studies attempting to calculate the actual impact of the paleo-earthquake and estimating its source region. We conducted a survey using a geo-slicer and GPS. We also performed paleo-environmental reconstruction by diatom analysis for the core samples obtained from the Toberi River mouth area, in Tokachi area to derive indicative data about the crustal movements. Since massive Neogene diatomaceous siltstones sediments containing fossil marine diatoms are widely distributed in the study area, we identified the reworked fossil marine species and excluded it from the diatom analysis in the paleo-environmental reconstruction.As a result of the geo-slicer survey, the tsunami deposits from the coast to the inland up to a distance of 1.8 km in a straight line could be detected. Changes in diatom assemblages which are reflective of inter-seismic subsidence and post-seismic uplift caused by the earthquake were also recognized. On the other hand, inferences derived from diatom analysis of geo-slicer core samples showed that the vertical crustal movement estimated by the elevation of the freshwater-brackish boundary of the core sample was maximum 2.3 m. The freshwater-brackish boundary was identified to be extending up to 1.9 km inland at 3.9 m altitude from the seashore, however it was not conspicuous in the inland and above the elevation at more than 4.0 m. This observation confirmed the relationship between the vertical crustal movements generated by the earthquake and the elevation of pale-sea level. Although it is difficult to reconstruct the crustal movements caused by the 12-13th century earthquake, in light of the above observations it can be concluded that they might possibly have risen up to tens of centimeters at least after the earthquake and then began to change to the inter-seismic subsidence.

キーワード：津波堆積物、地殻変動、珪藻分析、十勝地域
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