

The emergence of coastal disasters during the mid-Holocene highstand: An example from the coast of Hidaka, Hokkaido

*RYO NAKANISHI^{1,2}, Juichiro Ashi^{1,2,3}, Yusuke Yokoyama^{1,3}, Yosuke Miyairi¹

1. Atmosphere and Ocean Research Institute, The University of Tokyo, 2. Graduate School of Frontier Sciences, The University of Tokyo, 3. Graduate School of Science, The University of Tokyo

The IPCC fifth assessment report (AR5) predicts that natural disasters such as floods and storms will become more severe and more frequent due to the effects of climate change. Therefore, it is important to reconstruct natural disasters in the past sea-level highstand period from geological records for future disaster countermeasures. In the southern United States, the frequency of large-scale floods has been reported to increase during the mid-Holocene warm period (Ely, 1997; Knox, 2000). On the other hand, the scale of tsunamis and storms in coastal areas is expected to increase due to sea-level rise accompanying climate change, but few studies have been conducted on the scale and frequency of sea-level changes and coastal disasters. This study conducted a geological survey and certification of marine limits along the coast of Hokkaido and clarified the relationship between the timing of coastal disasters and sea level.

The geological survey was conducted on the current sea cliffs and past peatlands behind the beach in the southern, central and northern Hidaka area. The upper limit of marine sediments revealed by diatom microfossils and chemical analysis was around 6000-4000 BP. This period corresponds to the mid-Holocene highstand period, and then changed the sedimentary environment to freshwater and dry condition. Two to nine sand layers were identified, and all of the sand layers became thinner in the inland direction. Therefore, the sand layers were determined to be event layers originating from the beach. As a result of radiocarbon dating, the sedimentation age of the event layers was found to be limited to around 2000 years from the upper limit of the marine sediments. This result suggests that the event layers were formed during the highstand period. The relative sea-level rise along the Hidaka coast is estimated to be 1-3 m (Okuno et al., 2014). We presumed that such sea-level changes affected the tsunami and storm run-up in coastal areas.

Keywords: Tsunami deposit, mid-Holocene highstand, Hokkaido, Diatom, Coastal disasters