Offset in radiocarbon ages between marine bioclast and terrestrial plant pairs in the Holocene sediments along the Pacific coasts around Japan

*Nakanishi Toshimichi¹, Futoshi Nanayama², Kazuaki Hori³, Yuichi Niwa⁴, Junko Komatsubara⁵, Akihisa Kitamura⁶, Wan Hong⁷

1. Japan Atomic Energy Agency, 2. AIST/Kumamoto Univ., 3. Nagoya Univ., 4. Chuo Univ., 5. AIST, 6. Shizuoka Univ., 7. KIGAM

To identify chronological and spatial changes in the radiocarbon (¹⁴C) marine reservoir effects, the ¹⁴C ages of eight pairs of marine shells and terrestrial plants were measured from the same horizons of one core of Holocene sediments around Japan. The reservoir ages ranged from 60 to 1100 years, scattered over the period 100-10,200 cal BP, which were significantly larger than the values from "prebomb" samples of known age, before AD 1955 in this area. These results indicate that the information on reservoir effects is indispensable for chronological control not only from prebomb samples but also from geological and archaeological samples. Moreover, the effects also reflects the influence of complex river-mouth systems such as deltas and estuaries. To determine the direct chronological changes of the marine reservoir effect between the Kuroshio and Oyashio Currents, radiocarbon ages were measured from the same stratigraphic horizons within Holocene sediment cores along the Pasific coast of Japan (eastern Hokkaido; Nanayama et al., 2003, Nanayama, 2020, Sanriku Coast; Niwa et al., 2017, 2019, Arakawa Lowland; Komatsubara et al., 2009, 2010, Shimizu Plain; Kitamura & Kobayashi, 2014; Nobi Plain) and Taiwan. Subsequently, the results were compared with values from the Oita Plain and Hakata Bay on the northern coast of Kyushu, as well as the Korean Peninsula. The study was partially funded by the Japan Society for the Promotion of Science Kakenhi grant number JP18H01310.

Reference:

Kitamura A, Kobayashi K. 2014. Geologic evidence for prehistoric tsunamis and coseismic uplift during the ad 1854 Ansei-Tokai earthquake in Holocene sediments on the Shimizu Plain, central Japan. *Holocene*, 24(7), 814–827.

Komatsubara J, Nakashima R, Kimura K. 2009. Sedimentary facies and physical properties of the latest Pleistocene to Holocene sediment core GS-TKT- in the Arakawa Lowland, Toda City, Saitama Prefecture, central Japan. Journal of Sedimentological Society of Japan, 68(1), 13-25 (Japanese with English abstract).

Komatsubara J, Nakashima R, Kimura K. 2009. Sedimentary facies and physical properties of the latest Pleistocene to Holocene sediment core (GS-KZK-1) in the Shibakawa Lowland, Kawaguchi City, central Japan. Journal of Sedimentological Society of Japan, 69(2), 73-84 (Japanese with English abstract).

Nanayama F. 2020. Evidence of giant earthquakes and tsunamis of the 17th-century type along the southern Kuril subduction zone, eastern Hokkaido, northern Japan: a review. Characterization of modern and historical seismic-tsunamic events, and their global-societal impacts, Geological Society, London, Special Publications, 501, DOI: 10.1144/SP501-2019-99.

Nanayama F, Sakake K, Furukawa R, Shimokawa K, Shigeno K, Atwater BF. 2003. Unusually large earthquakes inferred from tsunami deposits along the Kuril Trench. *Nature*, 424, 660–663.

Niwa Y, Sugai T, Matsushima Y, Toda S. 2017. Subsidence along the central to southern Sanriku coast, northeast Japan, near the source region of the 2011 Tohoku-oki earthquake, estimated from the Holocene sedimentary succession along a ria coast. *Quaternary International*, 456(15), 1-16.

Niwa Y, Sugai T, Matsushima Y, Toda S. 2019. Millennial-scale crustal movements inferred from Holocene sedimentary succession of the Omoto plain, northern Sanriku coast, Northeast Japan: Relevance for modeling megathrust earthquake cycles. *Quaternary International*, 519(10), 10-24.

Keywords: Radiocarbon dating, Marine reservoir, Sedimentary facies, Pacific coast