

Local marine reservoir age variability at Luzon Strait and Ryukyu Islands during the Holocene

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The local marine reservoir age (ΔR) varies not only spatially, but also temporally because of changes in ocean circulation associated with climatic changes. Holocene ΔR values have mainly been reported from the South Pacific, while only a few spatio-temporal reconstructions of ΔR have been published in the western Pacific. Present day, short term variations in ΔR at the Ryukyu Islands, South Japan, were previously associated with variability in the El Nino-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). Further studies will better delineate this connection and establish the magnitude of the variability in ΔR in the western Pacific.

In this study, we measured high-resolution radiocarbon(¹⁴C) ages and U/Th dates obtained from fossil corals on Luzon Island in the South China Sea (SCS) and Kikai and Kodakara Islands in Ryukyu Island Chain during the Holocene. A large ΔR variability of ~400 years was recorded at both Luzon Island and the Ryukyu Islands for the last 6000 years. An abrupt ΔR shift occurred between 5.5 ka BP and 4.0 ka BP in the northwest Pacific. Compared with the previously reported data from the Tropical East Pacific and Great Barrier reef, the timing of the shift was different because the ¹⁴C content of the northwestern Pacific was affected by not only the intensity of upwelling at the Peru-Chile coast, but also by the East Asian monsoon.

This variability influences the calibration of local marine reservoir effect significantly when calibrating ¹⁴C ages to calendar ages. High-resolution ¹⁴C dating of marine samples became possible over the years, raising the need and importance of ΔR values to be reconsidered in high-resolution for different time periods.

Reference:

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