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Issues in radiocarbon and U-series dating of corals from the last glacial period

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Radiocarbon calibration beyond the extent of tree-ring records depends on U-series dating of fossil corals or speleothem, both of which can provide independent calendar ages. Less direct methods rely on layer counting and comparison with other well-dated records. In spite of considerable effort to provide a reliable radiocarbon calibration curve beyond 25,000 years, the majority of the data show large atmospheric radiocarbon peaks which are inconsistent both in magnitude and timing between different determinations. The results of the most recent work [Chiu, T.-C., Fairbanks, R.G., Mortlock, R.A., Bloom, A.L., 2005. Extending the radiocarbon calibration beyond 26,000 years before present using fossil corals. *Quaternary Science Reviews* 24 (16?17), 1797?1808], from Araki Island fossil corals, indicate a monotonic variation from about 33 to 49 ka, with no radiocarbon peaks, but with some gaps in the data. The difference between this and previous results, from fossil corals, has been attributed to selection of better-quality samples and rigorous analytical methods. However, previous results from Huon Peninsula [Yokoyama, Y., Esat, T.M., Lambeck, K., Fifield, L.K., 2000. Last ice age millennial scale climate changes recorded in Huon Peninsula corals. *Radiocarbon* 42 (3), 383?401; Cutler, K.B., Gray, S.C., Burr, G.S., Edwards, R.L., Taylor, F.W., Cabioch, G., Beck, J.W., Cheng, H., Moore, J., 2004. Radiocarbon calibration and comparison to 50kyrBP with paired ¹⁴C and ²³⁰Th dating of corals from Vanuatu and Papua New Guinea. *Radiocarbon* 46 (3), 1127?1160] show radiocarbon peaks exclusively located within the gaps in the Araki data. The timing of the gaps are not random, but appear to be related to severe climate and sea-level variations associated with Heinrich events initiated in the North Atlantic. We propose that the Huon and Araki data sets are complementary rather than exclusive and that the absence of coral growth at Araki Island during Heinrich events presumably reflect local adverse conditions for coral growth.

Keywords: Radiocarbon dating, Uranium series dating, Last Ice Age, Coral, reservoir age, Thermohaline circulation