



New insights into the radiocarbon calibration based on ^{14}C and U-Th dating of corals drilled offshore Tahiti (IODP Expedition #310)

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Beyond the high-precision tree-ring calibration, the fossil corals are the most reliable archive that can be used to calibrate the radiocarbon time scale. In this contribution, we present a new radiocarbon dataset based on paired ^{14}C and U-Th dating of fossil shallow-water tropical corals drilled offshore Tahiti during the IODP Expedition 310 "Tahiti Sea-Level". Before ^{14}C and U-Th analyses, rigorous screening criteria have been applied in order to select pristine aragonitic coral skeletons and avoid those displaying any post-mortem diagenesis that alters original ages. In particular, we made a significant effort to improve detection and quantification of very small amount of secondary calcite in the aragonitic coral lattice using X-ray diffraction measurements [1]. In addition, we apply a strict screening criterion based on $\delta^{234}\text{U}$. However, the new Tahiti dataset allow to refine the previous tolerance ranges previously adopted. More than 60 radiocarbon dates were processed at the Laboratoire de Mesure du Carbone 14 (Saclay, France) with the ARTEMIS AMS facility. This new Tahiti record provides new data to the radiocarbon calibration for two distinct time windows: for the interval between 29,200 and 36,200 years BP and for the last deglaciation period, with especially, a higher resolution (40 data) for the 14,000 - 16,000 years BP time interval. These new data extend the previous Tahiti record beyond 13,900 years BP which was the oldest U-Th age obtained on cores drilled onshore in the modern Tahiti barrier reef [2, 3]. These new results are compared with ^{14}C chronologies from other corals, those of Barbados [4, 5] and those from other Pacific islands (Mururoa, Vanuatu, Marquesas, Christmas), and from the Cariaco Basin sediment [6, 7], the Iberian Margin sediment [8, 9] and the Bahamian speleothem [10] records. The new ^{14}C dataset from the corals drilled offshore Tahiti allows to validate the precision and accuracy of other records either directly dated by U-Th or tuned to a dated target, with a special emphasise for the Heinrich 1 event for which there is a debate about interpreting the discrepancies observed between the different records [7]. For this time period, 15,000 - 17,500 cal ky BP, the Tahiti record supports the few data from the Iberian Margin record and from the Bahamas speleothems, but is in clear conflict with the Cariaco Basin record. The Tahiti record also allows to refine the significant variations of the atmospheric $\Delta^{14}\text{C}$ during the Bølling warming period, that might be interpreted as changes in the global carbon cycle due to variations in the rates of exchange between the different carbon pools.

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