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Intermediate water radiocarbon off west Sumatra during the last 45,000 years

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Radiocarbon content of intermediate waters originating from the Southern Ocean is held as the likely smoking gun of the events that triggered the atmospheric CO_2 rise and its radiocarbon content decline during the last glacial-interglacial transition. Extremely depleted radiocarbon has been found off the coast of Baja California, the Galapagos and the Arabian Sea, but not unequivocally elsewhere. Knowing the route of the old water is therefore central for the mechanistic linkage of Southern Ocean processes and the atmospheric response. Here, we present high-resolution radiocarbon content of intermediate depth waters off west Sumatra in the attempt to trace the hypothetical route of old water emanating near Antarctica. Sediment core SO189-39KL (0º47'S, 99º55'E, 517 m) resulted in a 1350 cm hemipelagic sedimentary sequence that spans the last 45,000 years and it was sampled for planktonic and benthic foraminifera radiocarbon determinations at a centennial time resolution. Besides the planktonic radiocarbon age control points, we attempted an independent stratigraphy based on the Mg/Ca sea surface temperature evolution and its apparent similarity with Antarctic Ice core records. This allowed us to infer surface reservoir ages as well as the D14C of the intermediate waters. Our results show that throughout the LGM and the entire deglaciation, radiocarbon content at 500 m depth off west Sumatra remained in equilibrium with the contemporaneous atmosphere, discarding this area as a probable route for the spreading of the old water along its way to northern latitudes. These results add up to increasing evidence that the radiocarbon content of intermediate waters originating from the Southern Ocean was not influenced by the upwelling of a large abyssal old water reservoir, as it has been hypothesized in order to explain the atmospheric deglacial records.