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Abrupt carbon release at the onset of the Bølling/Allerød: Permafrost thawing with inter-hemispheric impact

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Atmospheric carbon dioxide (CO_2) during the last deglaciation ($\sim$18–10 kyr BP) switched around 14.6 kyr BP from a rather gradual rise to an abrupt jump, which is recorded in ice cores as an increase of 10 ppmv in less than two centuries. So far the source of that CO_2 excursion could not be identified and the climatic implications are largely unknown. Here we use highly resolved U/Th dated atmospheric $\Delta^{14}C$ from Tahiti corals as independent age control for CO_2 changes. This provides a temporal framework to show that the northern high latitude warming into the Bølling/Allerød occurred quasi-synchronous to this CO_2 rise within a few decades. Furthermore we show that an abrupt release (within two centuries) of long-term immobile nearly ^{14}C-free carbon ($\sim$125 PgC) from thawing permafrost might explain the observed anomalies in atmospheric CO_2 and $\Delta^{14}C$, in line with CH_4 and biomarker records from ice and sediment cores. In transient climate simulations we show that the abrupt carbon release in the northern high latitudes and associated CO_2 changes bear the potential to modulate Antarctic temperature. These findings are in agreement with the observed onset of the Antarctic Cold Reversal about two centuries after the beginning of the Bølling/Allerød, as detected in independent annual layer-counted ice cores from both hemispheres. Based on the timing, magnitude, origin and the inter-hemispheric impact we speculate that this abrupt deglacial release of long-term stored carbon via thawing permafrost might have provided the final push out of the last ice age.