

Reply: Were last glacial climate events simultaneous between Greenland and France? A quantitative comparison using non-tuned chronologies

Blaauw, M., & Wohlfarth, B. (2010). Reply: Were last glacial climate events simultaneous between Greenland and France? A quantitative comparison using non-tuned chronologies. *Journal of Quaternary Science*, 25(6), 1047-1047. DOI: 10.1002/jqs.1368

Published in:
Journal of Quaternary Science

Document Version:
Publisher's PDF, also known as Version of record

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We thank Austin and Abbott (2009) for clarifying the role of the NAAZ II tephra in the debate on the synchronicity of past events of climate change (Blaauw *et al.*, 2009). Independently identified tephra layers could indeed prove vital in resolving the spatiotemporal pattern of Dansgaard–Oeschger events. However, there are still some caveats regarding the reliability of this tephra in marine and ice cores.

The NAAZ II tephra, caused by multiple eruptions, consists of one rhyolitic and up to four basaltic components (Wastegård *et al.*, 2006). Austin *et al.* (2004) report a well-defined rhyolitic NAAZ II tephra layer in their marine core. However, other studies such as that of Wastegård *et al.* (2006) report more mixed populations, including a common basaltic component, at each analysed depth. Therefore not all studies can establish a similar level of certainty that the rhyolitic component of NAAZ II is not ice-rafted to their sites, resulting in less reliable depths and ages of this tephra.

The age for the NAAZ II rhyolitic tephra in Greenland ice was based on layer counting of the NGRIP core (GICC05; Svensson *et al.*, 2006). However, while this tephra layer has been identified geochemically in other Greenland ice cores (Grönvold *et al.*, 1995; Zielinski *et al.*, 1997), to our knowledge no independent geochemical characterisation has yet been published for NGRIP. Therefore, no matter how plausible, the NGRIP/GICC05 age for the rhyolitic NAAZ II remains indirect.

Finally, even if the NAAZ II tephra could be used to ensure that one single event of climate change occurred simultaneously across a region (Dansgaard–Oeschger event 15), this does not necessarily mean that other climate events were synchronous as well. In other words, one swallow doesn't make a summer.

Acknowledgements Gill Plunkett and Stefan Wastegård are thanked for discussing tephra.

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