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Tree ring and ice core time scales around the Santorini eruption

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When studying cosmogenic radionuclides in ice core and tree ring archives around the Santorini eruption a $\sim$20 year discrepancy was found between the records (Muscheler 2009). In this study a new ^{10}Be dataset from the NGRIP ice core is presented. It has a resolution of 7 years and spans the period 3752-3244 BP (1803-1295 BC). The NGRIP ^{10}Be record and the previously published ^{10}Be GRIP record were compared to the IntCal datasets to further investigate the discrepancy between the ice core and tree ring chronologies. By modelling the ^{14}C production rate based on atmospheric ^{14}C records a comparison could be made to the ^{10}Be flux which is assumed to represent the ^{10}Be production rate. This showed a time shift of $\sim$23 years between the records. The sensitivity of the results to changes in important model parameters was evaluated. Uncertainties in the carbon cycle model cannot explain a substantial part of the timing differences.

Potential influences of climate and atmospheric processes on the ^{10}Be deposition were studied using δ^{18}O from the respective cores and GISP2 ice core ion data. The comparison to δ^{18}O revealed a small but significant correlation between ^{10}Be flux and δ^{18}O when the ^{14}C-derived production signal was removed from the ^{10}Be curves. The ion data, as proxies for atmospheric circulation changes, did not show any correlations to the ^{10}Be record or the ^{10}Be/^{14}C difference.

When including possible data uncertainties there is still a minimum discrepancy of $\sim$10 years between the ^{10}Be ice core and the ^{14}C tree ring record. Due to lack of alternative explanations it is concluded that the ice core and/or the tree ring chronologies contains unaccounted errors in this range. This also reconciles the radiocarbon 1627-1600 BC (Friedrich et al., 2006) and ice core 1642$\pm$5 BC (Vinther et al., 2006) datings of the Santorini eruption.

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Vinther, B.M., Clausen, H.B., Johnsen, S.J., Rasmussen, S.O., Andersen, K.K., Buchardt, S.L., Dahl-Jensen, D., Seierstad, I.K., Siggaard-Andersen, M.L., Steffensen, J.P., Svensson, A., Olsen, J., & Heinemeier, J., 2006: A synchronized dating of three Greenland ice cores throughout the Holocene. *Journal of Geophysical Research-Atmospheres* 111, 11.