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Dating of palaeomagnetic secular variation in Swedish varved lake sediments using radiocarbon wiggle-matching

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Well-dated natural archives are crucial when investigating the timing between climate change and climate forcing. Annually laminated (varved) lake sediments, in particular, can provide valuable knowledge about past climatic and environmental conditions as the annual nature of the sediments enables the establishment of high-resolution archives. In addition, lake sediments can record variations in the Earth's magnetic field, which has the potential to be used as a dating validation technique if the palaeo-secular and -intensity curves are dated correctly. If individual and well-defined geomagnetic events can be dated accurately, they can then be used as isochrones, thereby allowing the synchronisation of different records. We therefore aim to date the "f" event, a late Holocene secular variation change, which is recorded in many sites in the northern hemisphere.

Varved sites in Sweden have dated the "f" event to ∼2700 cal. yrs BP. In order to constrain this date further, we have used the radiocarbon wiggle-matching method on a lake in central west Sweden, Kälksjön (Stanton et al., 2010), whose chronology has previously been validated using a number of complimentary dating methods. With the radiocarbon wiggle-matching technique, closely spaced samples are measured and matched to distinct wiggles in the radiocarbon calibration curve. The advantage of using varve-dated sediments is that it is possible to know the exact number of years between each sample, and therefore improve the initial age model. We compare the wiggle-match results of Kälksjön with results from a newly discovered varved lake sediment sequence in southern Sweden, Gyltigesjön. This comparison can provide information about magnetisation processes in sediments, such as the length of the palaeomagnetic lock-in delay.

Stanton, T., Snowball, I., Zillén, L., Wastegård, S., 2010. Validating a Swedish varve chronology using radiocarbon, palaeomagnetic secular variation, lead pollution history and statistical correlation, Quaternary Geochronology 5, 611–624.