



Using ^{10}Be records to identify possible ^{14}C calibration uncertainties during the Holocene

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The Intcal04 and Intcal09 radiocarbon calibration records are based on multiple tree-ring ^{14}C data sets for Holocene period (Reimer et al. 2004, Reimer et al. 2009). While the dendrochronological dating of the trees is supposedly free of errors there are differences between various ^{14}C data sets that underlie the ^{14}C calibration curve. Due to lack of knowledge about the reasons for the differences the Intcal04/09 calibration curves provide a smoothed average of the underlying ^{14}C records. Therefore, problems in one or several of the underlying ^{14}C records would translate directly into errors in the ^{14}C age calibration.

Additional knowledge about expected variations in the ^{14}C production rate could help to improve the calibration record since it would allow us to assess how well the different ^{14}C records represent the atmospheric ^{14}C concentration.

I propose that ^{10}Be records could be used as additional criteria to chose which of the published ^{14}C records should be preferred (or given stronger weight) for the construction of the calibration curve. Alternatively, ^{10}Be records could point to periods where ^{14}C data should be re-measured in order to improve the calibration curve. I will show for some case studies that the ^{10}Be records from the Greenland ice cores (Muscheler et al. 2004, Vonmoos et al. 2006) indeed provide useful information to scrutinise the Intcal04/09 calibration curve, which could help to improve the ^{14}C calibration curve during the Holocene. Especially shorter-term changes are strongly dampened in the Intcal04/09 calibration record. However, ^{10}Be and some ^{14}C records do exhibit more variability as compared to the calibration record. Therefore, the combined $^{10}\text{Be}/^{14}\text{C}$ approach could add confidence that these should be reflected in the ^{14}C calibration record.

References:

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