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Interactive comment on “CO₂ radiative forcing during the Holocene Thermal Maximum revealed by stomatal frequency of Iberian oak leaves” by I. García-Amorena et al.

I. García-Amorena et al.

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Our stomatal index based CO₂ reconstruction for the later part of the Holocene indeed includes only very few data points, as we clearly state in the manuscript. The good agreement, however between CO₂[SI] and CO₂[ice] for the early to mid-Holocene points towards the reliability of the reconstruction. Potential methodological uncertainties have been tested and accounted for in general (e.g. Wagner et al., 1999; Indermühle et al., 1999; Royer, 2001) and specifically for Quercus (Van der Burgh et al., 1993; Kürschner et al., 1996; Van Hoof et al., 2006, 2008). The reproducibility of CO₂[SI] over wide geographical ranges spanning the entire northern hemisphere has been demonstrated recently (Wagner et al., 2004).

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The low data density for the later part of the Holocene, with only one point at 1000BP of course does not allow any well constraint conclusions about the CO₂ development during this period and we do not, in contrast to the comment by Luethi, interpret our data as a proven drawdown of CO₂ between 4000BP and 1000BP. Nevertheless, our data suggest a downwards tendency from the Holocene Hypsithermal towards the late Holocene. The calculated radiative forcing changes resulting from our CO₂[SI] profile are in good agreement with Holocene temperature reconstructions from a wide variety of records, from the marine, terrestrial and cryospheric realm.

Causes and consequences of discrepancies between CO₂[SI] and CO₂[ice] records have been discussed by Van Hoof et al. (2005, 2008). To date, no explanation has been offered for the lack of parallelism between millennial scale (at least) northern hemispheric temperature variations and Antarctic atmospheric CO₂. The potential coupling between large scale temperature fluctuations and atmospheric CO₂ dynamics as suggested by our data set is in our opinion worth mentioning, but we definitively agree with the comment that the low data density does not allow robust conclusions. Additional leaf assemblages from northern Iberian sites are currently under investigation and leaf bearing sequences from contrasting geographical locations in Scandinavia are identified.

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