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Climate of the Past Discussions

Interactive comment on "Fossil plant stomata indicate decreasing atmospheric CO_2 prior to the Eocene–Oligocene boundary" *by* M. Steinthorsdottir et al.

Anonymous Referee #2

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General comments:

Steinthorsdottir and co-authors analyzed fossil Eotrigonobalanus furcinervis leaf samples from a variety of sites in Saxony. These plant fossil rich sites are since many decades subject to intensive investigations, but due to their very specific geological evolution notoriously difficult to tie into any global stratigraphic framework. Nonetheless, the authors managed to place the leaf assemblages studied very well into a stratigraphic framework that reaches as much accuracy as possible.

By doing so, the study contributes a high resolution palaeo- pCO2 reconstruction for the late Eocene and some points in the upper Oligocene. Especially the older part of the

time period analyzed, from ∼40 to 35 ma, is so far still underrepresented in available stomatal frequency records, and thus a valuable addition to the growing number of data-sets.

The authors decided to calibrate the measured stomatal frequency data semi-quantitatively by applying the so-called 'stomatal ratio method' and they thus infer changes that should be seen as trends in CO2 rather than an absolute quantification of atmospheric CO2. In the present study leaves are included that have a very high taxonomic control, given the expertise and experience of the co-author's involved. The chosen method is in my eyes appropriate for the production of time-series data, although the absolute pCO2 levels might be subject to methodological uncertainties. The mean pCO2 values deduced are quite well comparable to earlier E. furcinensis based CO2 inferences (Roth-Nebelsick et al., 2012) where one single data point for the Late Eocene is available.

Despite remaining age uncertainties and methodological issues, the presented data set for the first time provides a good resolution time-series analysis for the critical period throughout the late Eocene. This interval is ambiguous in the so far available stomatal frequency records and the Steinthorsdottir et al. data set structurally contributes to the Cenozoic pCO2 data compilation based on plant responsiveness to CO2.

Slightly far-reaching, however, might be the author's discussion and conclusions on the CO2 – global sea surface temperature records. Although tempting based on their provided data, I do miss some more in-depth discussion on this topic, also bearing the remaining age uncertainties in mind.

Specific comments:

Fig. 4: the layout could be improved by consistent axis labelling, use of tick-marks, line thickness etc.

Section 1.2 is rather long, could be shortened by focusing on the applied quantification

strategy only p.4988 l.10: add refs p.4988 l.23-25: you may want to delete this sentence

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Interactive comment on Clim. Past Discuss., 11, 4985, 2015.