

Interactive comment on “The $p\text{CO}_2$ estimates of the late Eocene in South China based on stomatal density of *Nageia* Gaertner leaves” by X.-Y. Liu et al.

X.-Y. Liu et al.

lssjjh@mail.sysu.edu.cn

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1. The raw data consists of 13 leaves: nine extant leaves from 11 different herbaria specimens, and four fossil leaves. This is a thin data set. The four fossil leaves are really at the cusp for making a statistically meaningful paleo- CO_2 estimate (a minimum of 11 leaves is typically recommended). As for the extant leaves, couldn't a large sample from living trees be made? This would help to document the natural variability of stomatal distributions in the species; the current data set is inadequate in this regard.

We have added more specimens as suggested.

2. Kouwenberg et al. 2003 (p.2623, line 23) recommends for conifers that have or
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dered rows metrics related to the number of stomata per unit length. The authors should try this. Several other related points: by convention, non-stomatal bearing areas are typically excluded when calculating stomatal density and stomatal index (e.g., the bands between the stomatal rows); did the authors do this? How do your paleo-CO₂ estimates compare when using the other four possible extant calibration points? It would be helpful to know this variability. And finally, Franks et al. (2014, *Geophysical Research Letters*) proposed recently a new paleo-CO₂ method that does not require extant calibrations and follows plant physiological first principles, not ad-hoc calibrations. The required measurements are stomatal density, stomatal size, and leaf δ¹³C. Your *Nageia* fossils would be an ideal application of this new method.

We have tried the method from Kouwenberg et al. (2003). The result is not as good as the original one we used. Except for the SDL, the other

3. The age constraint for the fossils is only given as “late Eocene”. How was this Age determined? The age uncertainty should be included in Figures 4-5 (i.e., the late Eocene is a fairly long interval).

The age is about 38.5-42.0 (Wang et al., 1994). The details of layers have published in our previous paper Liu et al. (2015) – Xiaoyan Liu, Qi Gao & Jianhua Jin*. 2014. Late Eocene leaves of *Nageia Gaertner* (section *Demmaroideae* Mill.) from Maoming Basin of Guangdong, South China and its implication on phytogeography. *Journal of Systematics and Evolution*. 53(4):297–307.

4. Because the stomatal ratio approach is semi-quantitative, it is largely misleading to report 95% uncertainty bands. Also, this uncertainty analysis does not take into account uncertainty in the SR-RCO₂ transfer function (i.e., the authors assume no uncertainty) Yes, we calculate all the individual data separately and got the 95% uncertainty bands at last. They are not taken into the function directly.

Other more minor points were corrected as suggested. Only the following points need to be stated:

p.2619, line 20: How is a group “special”?

We explained why Nageia is special by the clause following the word “Podocarpaceae”.

Please also note the supplement to this comment:

<http://www.clim-past-discuss.net/11/C1880/2015/cpd-11-C1880-2015-supplement.pdf>

Interactive comment on Clim. Past Discuss., 11, 2615, 2015.

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