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Climate of the Past Discussions

Interactive comment on "A new age model for the Pliocene of the Southern North Sea Basin: evidence for asynchronous shifts of marine and terrestrial climate" *by* Emily Dearing Crampton-Flood et al.

Anonymous Referee #1

Received and published: 12 June 2019

A well written paper which presents a multi-proxy based reconstruction of Pliocene marine sea surface temperatures and terrestrial climate of the Southern North Sea Basin. The core was taken in a marginal marine setting, and the interpretation particularly of the lipid biomarker proxy record is difficult as the signal is influenced by a multitude of marine and terrestrial factors. The authors are generally aware of the potential implications and the manuscript contains a thoughtful and careful discussion of the potential controls and limitations. However, the authors final conclusion about marine and terrestrial climate evolution during the mid Piacenzian warm period (mPWP) and

reorganization of the North Atlantic Current does not seem to be supported by data. I disagree with the statement that lipid biomarker and palynology-based temperature proxies suggest a stable warm climate during the mPWP. In fact, the lipid biomarker shows mean annual temperatures ranging from 7 to 12°C during the mPWP (Fig. 6) and only between 3.17 Ma and 3.1 Ma a plateau. No conclusion on terrestrial climate variability during the mPWP can be drawn from the terrestrial pollen and spores as this 300 ka long interval is only covered by 4 samples. TEX86, which has been interpreted as representing winter temperatures, shows relatively constant temperatures during the mPWP, while UK37 indicates very variable summer SSTs. However, the authors point out that the high values could in part be caused by freshwater algae that have little or no correlation with temperature. In fact, there are several indicators suggesting that at least some of the major changes in proxy values are controlled by the changing depositional environment and associated fluvial input. The statement of an overall "asynchronous shift of marine and terrestrial climate" indicating a reorganization of the NAC during the mPWP appears to be an unnecessary over-interpretation of the otherwise very interesting data.

Minor comments: Line 18 and 48: Be consistent with mPWP which is called in the abstract mid-Pliocene Warm Period and Introduction mid-Piacenzian Warm period. As the mPWP is part of the late Pliocene, the latter seems to be more appropriate.

Line 196: dinocysts and sporomorphs (or pollen and spores) were counted

Line 260 ff.: Can the lipid biomarker method part be shortened?

Line 327 and figures: "Heather" which represent the actual plants of the family Ericaceae is better than "heath" which normally means the entire heathland habitat.

Line 329: The authors counted approximately 200 pollen and spores per sample and excluded the bisaccate taxa from the pollen sum. I am wondering how many angiosperm pollen are actually left? Please provide more details on the total pollen sum (e.g. in Fig S1) and the pollen sum which has been used to calculate non-bisaccate

pollen percentages.

Line 513: Fig. 4d should be 3d

Line 425: Why do the authors refer to Donders et al, 2007? The palynological results from the Hank borehole seem to suggest the opposite in indicating the continuous presence of warm-temperate taxa (Fig. S1). Please discuss.

Line 605 and Fig. S1: The acme of Osmunda coincides with a decline of almost all other taxa in the pollen diagram. The authors state that Osmunda has been excluded from the pollen sum, and I am struggling to see which other taxa increased. They do not seem to sum up to 100% at ca. 306 m.

Fig.2 and Fig 3: Rephrase in figure captions “The intervals corresponding to A, B C depth discussed in the text are indicated” and provide keys to colours (e.g. marine/deltaic etc).

Fig 4. Provide proper depth scale instead of arrow.

Fig. 6 Add depth scale to age scale to allow better comparison across figures.

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