Clim. Past Discuss., 11, C2653–C2656, 2015
www.clim-past-discuss.net/11/C2653/2015/

Climate of the Past
Discussions
Open Access

CPD
11, C2653–C2656, 2015

Interactive Comment

Interactive comment on "Late Cretaceous (Late Campanian–Maastrichtian) sea surface temperature record of the Boreal Chalk Sea" *by* N. Thibault et al.

I. Jarvis (Referee)

i.jarvis@kingston.ac.uk

Received and published: 15 December 2015

General Comments: This is an excellent detailed regional study of SST variation at the end Late Cretaceous (Late Campanian – Maastrichtian). The paper employs very high-resolution (∼4.5 kyr) carbonate stable isotope (δ13C, δ18O) data from the Upper Campanian – Maastrichtian of a Danish Chalk core, combined with lower resolution nannofossil assemblage data, to present an age-calibrated SST record for the Boreal Chalk Sea. An integrated stratigraphy incorporating biostratigraphy and magnetostratigraphy is developed by δ13C chemostratigraphic correlation to astronomically calibrated South Atlantic and offshore Western Australia ocean drilling sites.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

A novel new nannofossil temperature index is presented that shows consistent SST trends to bulk δ18O data. This provides essential additional support for the still controversial use of bulk pelagic/hemipelagic carbonate oxygen stable isotope data for SST reconstruction (cf. e.g. Jarvis et al., 2011. Black shale deposition, atmospheric CO2 drawdown, and cooling during the Cenomanian-Turonian Oceanic Anoxic Event. Paleoceanography http://onlinelibrary.wiley.com/doi/10.1029/2010PA002081/abstract; Jarvis et al., in press. Intercontinental correlation of organic carbon and carbonate stable isotope records: evidence of climate and sea-level change during the Turonian (Cretaceous). The Depositional Record http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2055-4877)

Specific Comments: Do other published Cretaceous NTIs generate compatible trends to the new index utilized here? A comment on this would be appropriate. Are any significant productivity changes apparent from the nanno data? Previous nannofossil studies commonly attempt to derive such data.

The combination of complementary biotic and geochemical SST proxies, together with consistent trends in a South Atlantic site, provides a convincing argument for the reliability of the analytical approach and interpretation. A direct link between SSTs and δ13C and long-term sea-level trends offers support for long-term glacio-eustacy during the latest Cretaceous, despite the increasing popularity of 'aquifer-eustacy' as a forcing mechanism in the mid-Cretaceous (e.g. Hay & Leslie, 1990; Wendler & Wendler, in press. Palaeogeogr. Palaeoclimatol. Palaeoecol. http://dx.doi.org/10.1016/j.palaeo.2015.08.029). A brief comment relating to such alternative models would be appropriate.

Editorial suggestions: p5051 l3 Development of Late Cretaceous gateways and ocean circulation has been considered recently by Moiroud et al., in press. Evolution of neodymium isotopic signature of seawater during the Late Cretaceous: Implications for intermediate and deep circulation. Gondwana Research http://dx.doi.org/10.1016/j.gr.2015.08.005

p5051 l13 cooling was gradual

p5051 l19 epicontinental seas,

p5051 l 21-22 lower case west and north

p5051 l26 . . . of Stevens-1 have been described in detail by

p5051 l29 use of Myr versus Ma. This will likely depend on journal style. However, I personally believe that greatest clarity is achieved if you clearly differentiate time (kyr, Myr) and age (ka, Ma) when quoting numeric values, but this is of course controversial – e.g. www.geosociety.org/TimeUnits/

p5052 l11 remove hyphen, age model

p5052 l15 uncompacted sedimentation rate

l5052 l22 calculated as 0.1 ‰

p5053 l1 Denmark are in agreement

p5053 l5 Maastrichtian,

p5054 l21 little recrystallization

p5055 l16 Danish Basin are also

l5055 l15-17 repetition: this sentence repeats information previously presented on p5052-5053

p5055 l20 comment: why only ‘early’ diagenetic alteration? Surely both early and late (burial) diagenesis could potentially be significant. The former is commonly argued to produce higher δ18O values (cold bottom water diagenesis superimposed on primary higher SST values), the latter, lower δ18O values (addition of isotopically light burial cements).

CPD

11, C2653–C2656, 2015

P5056 l12 add paragraph break before The K–Pg boundary . . .

P5056 l14 only local,

P5056 l18 Højerup Member,

P5056 l19 Stevns Klint,

P5056 l26 add paragraph break before A sharp decrease . . .

P5057 l5 mid-lati-

P5057 l11 northwestward currents,

P5058 l1 add paragraph break before When comparing δ18O values . . .

p5058 l27 values, while

p5059 l14 add paragraph break before Decoupling and lead-lag . . .

p5060 l1 add paragraph break before Although no direct evidence . . .

p5062 l19 Cenozoic

Conclusion: The data and interpretations presented offer an excellent comparative data set for future high-resolution studies of long-term end-Cretaceous climate change. Similar data sets need to be obtained from other geographical areas and from contrasting depositional settings. Such work is essential to adequately constrain long-term climate change during the latest Mesozoic, and to provide a better perspective on the environmental changes accompanying the K–Pg boundary event.

The paper is concise, clearly written and well illustrated. A few minor editorial amendments are suggested, but I otherwise recommend publication following minor revision. A nice piece of work.

Interactive comment on Clim. Past Discuss., 11, 5049, 2015.