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

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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.

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
cooling was gradual
epicontinental seas,
lower case west and north
of Stevens-1 have been described in detail by
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/
remove hyphen, age model
uncompacted sedimentation rate
calculated as 0.1‰.
Denmark are in agreement
Maastrichtian,
little recrystallization
Danish Basin are also
repetition: this sentence repeats information previously presented on
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 $\delta^{18}O$ values (cold bottom water diagenesis superimposed on primary higher SST values), the latter, lower $\delta^{18}O$ values (addition of isotopically light burial cements).
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-latitudinal 
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.