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Interactive comment on "The colonization of the oceans by calcifying pelagic algae" *by* Baptiste Suchéras-Marx et al.

Anonymous Referee #1

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Dear Editor,

The manuscript by Suchéras-Marx et al. presents an interesting compilation of calcareous nannoplankton accumulation rate records through the Jurassic to Neogene. Combined with earlier published compilations of nannofossil species richness and coccolith mean size through this interval, these records provide interesting insights in the macroevolutionary patterns involved in the colonization of the world oceans by calcareous nannoplankton. The manuscript is generally well-written and concise, and presents an interesting discussion on the observed evolutionary dynamics.

Perhaps the only major point of concern is the geographical limits of the data set. For the Jurassic and Cretaceous (representing a very long time interval, which happens to be crucial for the colonization of the world oceans by calcareous nannoplankton), basically all of the data sets are from the Northern Atlantic & Western Europe. While I realize that the authors are limited by the availability of data sets, I think this is a major weakness of the presented compilation, and a point that is not sufficiently addressed in the manuscript. The authors should include a bit of discussion on the possible problems and/or complications with their data set. How sure are the authors that the Northern Atlantic/Western European records are representative for the global oceans? The authors talk about "open oceans" of the Valanginian, but the Northern Atlantic is still relatively isolated by these times. We know absolutely nothing about the real open oceans (the Pacific & the eastern Tethys). Is it possible that the recorded patterns are diachronous between different ocean basins? I think this merits at least a little bit of discussion, also if the authors do believe they can build a case based on the Northern Atlantic and Western European records alone.

Likewise, here and there, the authors oversimplify things a little bit too much, in my opinion. For example, describing the Early Cretaceous to Late Cretaceous, a period of ~60 million years(!), with major pulses of mid ocean spreading, oceanic anoxic events, soaring atmospheric pCO2 concentrations, major climate shifts, major evolutionary developments in many biological groups, as "characterized by a relatively stable environmental setting" is perhaps a bit to simplistic. It feels a bit like a reversed argumentation: "because we see evolutionary patterns that are compatible with the Red Queen macroevolutionary model, the changes in the physical environments must be limited." While I follow the authors in that the influences of the biotic interactions (forcing a Red Queen type evolution) were probably stronger in this time interval compared to the influences of abiotic environmental changes, it is way to simplistic to state that, therefore, the 60 million year period of the Early Cretaceous to Late Cretaceous was characterized by stable environmental conditions... The authors could, and should, rephrase these kind of statements, to incorporate a bit more nuances.

One more thing: I highly recommend using more than one pCO2 reconstruction for this time interval (the Jurassic to Neogene). The authors have chosen to use the compilation presented in Hönisch et al. (2012) as there sole atmospheric pCO2 record, while this particular reconstruction seems to underestimate the pCO2 concentrations for the mid-Cretaceous (a crucial interval for the present study). These kind of problems can be circumvented by using more than one compilation or model-based reconstruction, averaging out potential problems with any particular reconstruction.

To conclude, with a little bit more nuancing and a bit more discussion on the possible problems and pitfalls, this manuscript has the potential to be an important contribution to the field. Therefore, I believe manuscript merits a publication in Biogeosciences, after some major revisions.

Attached to this review is a list with comments and suggestions.

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2018-493/bg-2018-493-RC1-supplement.pdf

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-493, 2018.