

Interactive comment on “Quantifying the Cenozoic marine diatom deposition history: links to the C and Si cycles” by Johan Renaudie

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By compiling visually estimated microfossil and biogenic silica estimates based on a very large data set, this paper provides a significant contribution to our understanding of oceanic silica production over time, and by implication continental weathering since the Cretaceous. But by focusing on weathering, the author may be underplaying the impact of unrelated open ocean upwelling over time.

I have read the assessments of reviewers 1 and 2 and strongly agree with all of their independent assessments of the strengths and weaknesses of the paper. I especially endorse Reviewer 2's comments about the uncertainties associated with shipboard smear slide analysis. Many parameters conspire to reduce the recognition of diatoms in shipboard smear slides: (1) carbonate obscures diatoms, (2) Slides have been pre-

C1

pared using different mounting media – some are fairly low refractive index, making diatoms difficult to resolve, (3) partial dissolution of silica dramatically impacts smear slide assessment, (4) slides made by the lithostratigraphy team are often still made on microscope slides rather than on the cover glass, making it impossible to analyze slides at high magnification, and (5) slides are often only analyzed at low magnification, leaving diatoms unrecognized. The most significant variable is the varied experience of the team. It's been my experience that visual estimates of diatom content can vary dramatically based on the parameters outlined above. The impact of these significant uncertainties is lessened by the large data set, so I am confident that the overall trends described are real. The manuscript will be improved with these caveats discussed.

P3/Ln 7. There are many examples of post-Paleogene cherts, including Quaternary examples. Such early diagenesis would greatly underestimate diatom abundance, as would relatively low abundance due to dilution from high terrigenous input.

P4/Ln 24: “the main loci of diatom deposition in both the current analysis results for the Pleistocene and the reference datasets are the Southern Ocean, followed by the North Pacific and the eastern Indian Ocean while radiolarians add an opal deposition locus in the Pacific equatorial belt.” Some of this is undoubtedly higher dissolution among diatoms vs rads. This is in part a direct result of the rads that live beneath sinking diatoms. The paper generally lacks a discussion of the impact of silica dissolution, which is often dramatic and will skew the interpretation. Silica dissolution is a complex process that regionally alters the paleoproductivity signal. (Some new papers discuss the record and potential impact of diatom dissolution; e.g., recent papers by Warnock).

Some additional editorial comments regarding usage throughout the paper. 1. Although technically acceptable, there is heavy reliance on parenthetical comments and clauses. In many cases this complicates rather than simplifies the content.

2. P5/Ln 25-26: Diatoms accumulated in abundance in all sectors. . .

3. Stratigraphic usage: The author of this paper does a pretty good job of avoiding

C2

common errors with regard to time and time-rock units (Late vs Upper, etc.), but there are a few items that I take issue with. (a) When used as formal stratigraphic terms, Upper, Lower and Middle should be capitalized – doing this helps distinguish formal stratigraphic assignment. For example, “Upper Miocene” refers to a specific, defined stratigraphic subunit, whereas “upper Miocene” less specifically refers to rocks deposited during the later part of the Miocene. (b) There are also some misuses of tense in stratigraphic description. Bear in mind the difference between time and rocks (e. g., T. rex lived during the Late Cretaceous, but T. rex fossils occur in Upper Cretaceous rocks). The author makes some quite minor errors of tense in a few places. For example, P3/Lns 31 and 32 should be past tense (peaked and occurred, rather than peaks and occurs) because he is referring to an event in time (which is past) rather than the geological manifestation (which still exists in the present). Other examples include (1) P4/Lns 2, 3: During the Early Miocene, diatom abundance in sediments was somewhat lower. . . loci that expanded during the Middle Miocene and (2) P4/Lns 14 + 16: This drop mainly affected. . .in the Indian Ocean seems to have risen significantly.

4. Typos, etc: 2/20 Although rather than While. 4/5 rises rather than raises. 4/7 whereas instead of while. 4/10 Atlantic. 4/24 These. 4/25 delineate? 8/11 diatoms. There is some mixing of UK and US English usage.

My overall assessment is that this paper is very worthy of publication with the relatively minor changes recommended by me and my fellow reviewers.

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