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Interactive comment on "A global diatom database – abundance, biovolume and biomass in the world ocean" *by* K. Leblanc et al.

Anonymous Referee #1

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This manuscript represents an enormous effort to compile quantitative estimates of diatom species abundance throughout the world oceans. This is a herculean task and the authors are to be commended for their efforts. I find the presentation to be very objective with adequate discussion of the data quality control and of biases due to the uneven distribution of data, undersampling, etc. The statistics performed are at an appropriate level of detail given these limitations. The analysis confirms past findings that a relatively few species comprise most of the diatom carbon biomass and identifies the key species involved. This should be an extremely valuable database for modelers. My only significant concern arose in reviewing Table 4 were the integrated diatom carbon values are summed across oceans to estimate global marine diatom carbon and silicon biomass. There are data on at least the biogenic silica concentrations in open ocean systems which presumable reflect mainly diatoms, but will also include contributions by

silicoflagelattes, radiolarians and other siliceous plankton. Those measurements show integrated biogenic silica concentrations (upper 100 – 150 m) to average roughly 3-4 mmol Si m-2 (e.g. Table 1 in Brzezinski et al. (2011) DSR I, 58, p 988) with values up to 10- 50 mmol Si m-2 in the Sargasso Sea during diatom bloom events with most blooms being 6- 10 mmol Si m-2 in the Pacific The issue is that the data in Table 4 yield average biogenic silica levels in the Pacific and Indian Oceans that are at bloom levels and above when using the geometric means (below). All oceans would have bloom levels of biogenic silica or higher on average if the arithmetic means are used. Arctic 6.3 mmol Si m-2, Atlantic 5.2 mmol Si m-2, Pacific 18.5 mmol Si m-2, Indian 37.5 mmol Si m-2, Southern 4.7 mmol Si m-2 The biomass estimates thus appear far too high (by a factor of 2-3) over much of the ocean. My hypothesis is that this occurs because the data are not separated by depth (coastal versus open ocean) and the high coastal values bias the average stocks for the entire ocean basins to be high. Extrapolation over the vast area of the open sea amplifies the problem. This potential bias would also cause the estimated turnover time of diatom biomass to be significantly underestimated, possibly by a factor of 2-4. Since all of the data are geo-referenced they could be examined as a function of bottom depth to see if there is merit to my hypothesis. Irrespective of the outcome of such an analysis I would advocate that the discussion of Table 4 compare the results to actual measurements of biogenic silica concentrations in each ocean (possible for at least the Atlantic, Pacific and Southern Ocean) to provide the reader with greater insight and context.

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