

Interactive comment on “Global ocean biomes: mean and temporal variability” by A. R. Fay and G. A. McKinley

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Author Response to Anonymous Referee #1

Ocean provinces are useful to aggregate data for further analysis. In the present paper the authors develop a new set of ocean provinces but they deliberately ignore coastal areas. Yet, coastal areas are important in marine biogeochemistry, and are “hot spots” of primary production, CO₂ fluxes, DMS fluxes, CH₄ fluxes, etc.. Hence, the proposed ocean provinces are of limited use, and do not cover the “global” ocean as stated in the title.

>Thank you for identifying this need for clarification. While we acknowledge the importance of studying the biogeochemistry of coastal ocean regions, we also note that the

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increased complexity and large variability makes the definition of gyre-scale biomes less relevant. In studies of the global-scale ocean carbon cycle and biogeochemistry, it is common for coastal regions to be excluded from analysis (whether by using bathymetric or salinity conditions; e.g. Takahashi et al. 2009, Gruber et al. 2009, Sarmiento et al. 2004) and to be addressed separately by other researchers. We have updated the title of our manuscript to specify that these biomes only cover the “open-ocean”.

The authors show that there are inter-annual variations in limits (and surface) of the provinces, yet, they do not explore the reasons of this inter-annual variations. Is this related to ENSO?

> It is not in the scope of this paper to fully analyze the reasons for this inter-annual variation in the biomes. We have expanded the Discussion section that presents possible causes of select years with strong anomalies in biome area. However detailed analysis of causes linked to global climatic oscillations are beyond the goals of this paper. We hope to inspire further studies that will utilize these biomes to consider causes of the inter-annual variations.

Graphical comparison with other ocean province classifications (Reygondeau, Longhurst) could have been useful.

We have included maps of the Longhurst provinces overlaid on our global mean and core biomes for improved intercomparison (Figure 6)

In principle, a figure should be understood from the figure legend alone, without having to read the ms. The figures in the preset ms do not achieve this: from legends of Figs 1 & 2 it is not possible to understand the difference between “core” and “mean”, what the abbreviations stand for, what do the white areas stand for.

> We have improved figure captions to make them independently descriptive of the figure. Thank you for feedback.

The map of biomes was present in Fig. 1 of Fay & McKinley (2013) and methodology

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to discriminate the biomes also presented in the material and methods of the same paper. It is unclear what is the aim of the present ms.

>The biomes are very similar to those presented in previous articles by the authors (McKinley et al. 2011; Fay and McKinley 2013), we have improved the biomes by adding an additional parameter (sea ice fraction) as well as created time-varying biomes which had not previously been included in our work. The aim of the present manuscript is to detail these revised biome maps, as well as all criteria used in their development so that they can be readily available for others to use. This was not accomplished in our previous work.

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