

Interactive comment on “Simulating the growth and distribution of planktic foraminifer using an ecophysiological multi-species model” by F. Lombard et al.

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We thank Michal Kucera for raising those points, which are not trivial.

1) and 2) In the previous response we did drifted on the very interesting subject that is population dynamics. But it might be confusing for the readers: it is totally beyond the purpose of the present paper. We feel it is necessary here to underline that the individual growth rate model is mechanistic but the link between species abundance and individual growth rate is empirical. The empirical relationship links the individual growth rate to number of adults / m³. And thus the model will then simulate number of adult individuals /m³ from temperature and chlorophyll data. In the present paper there

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is no population dynamics as we think there are currently not enough observations to calibrate population growth (including individual size effect, mortality, reproduction and predation) for the different species considered. While it has no direct link with population growth, the model allows reproducing about half of the observed variability, and we believe that including population dynamics would allow improving the model. Then it is clearly the next step to improve modeling of the planktic foraminifera species abundance (as we stated several times in the manuscript) and we are grateful to the reviewers for providing interesting discussion and data set for this following step.

4) We were not thinking about dissolution on the seafloor (which we know samples have been checked for), but dissolution during sedimentation (as shown by Schiebel et al 2007, also see Schiebel 2002). The text has been modified in order to be clearer. We agree with the reviewer that dissolution, even in the water column, cannot explain the model misfit in some Pacific and Indian Ocean areas. For *N. dutertrei*, that develop mainly at depth in tropical and subtropical areas, the model fit with the data is much better using simulation with PISCES data (thus taking the water column into account) than with surface satellite data (see Table 3.). For species having symbionts and living closer to the surface, we do not know the reasons for the misfit particular to the warm pool area.

Schiebel, R.: Planktic foraminiferal sedimentation and the marine calcite budget. *Global Biogeochemical Cycles*, 16, 1065, doi:10.1029/2001GB001459, 2002.

Schiebel, R., Barker, S., Lendt, R., Thomas, H., and Bollmann, J.: Planktic foraminiferal dissolution in the twilight zone, *Deep-Sea Research Part II-Topical Studies In Oceanography*, 54, 676-686, 2007.

Point # 5: we also did not know why the pattern of *G. ruber*/*G. sacculifer* is inverted comparatively to Siccha et al (2009) in the red sea while it succeed to reproduce it elsewhere in the oceans. We can only suspects other processes (or parameters, either physical (turbulence, mixing), chemical, or biological (cryptic species, inadequate

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preys, competitors or predators)) that are not take into account in our model to influence foraminifers composition in this area.

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