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Interactive comment on "Projected climate change impacts on North Sea and Baltic Sea: CMIP3 and CMIP5 model based scenarios" *by* D. Pushpadas et al.

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Response to the review #1

We appreciate the efforts the reviewer has spent on the paper. However we don't agree with the reviewers conclusions nor do we think the review is particularly constructive. In the following we respond to the reviewers major four points:

"The research presented here is not appropriate for publication in Biogeosciences"

Reply: This is obviously not true, looking into aims and scope of biogeosciences, we find that research related to "Earth system sciences and response to global changes"

is particularly invited by the journal.

“The study is merely a technical exercise and there are no scientific insights about changes in biogeochemical cycling. “

Reply: We strongly disagree! This is a theoretical scientific study, but not a technical exercise. We did analyse changes in the atmospheric forcing and did study how the biogeochemical cycles respond to the projected changes in forcing. We further studied the importance of oceanic and atmospheric forcing for the biogeochemical cycles and how they compared to each other. We further investigated spatial variations in trophic amplification. Finally, we present an approach to assess for the first time the uncertainty of regional future projections of the biogeochemical response to climate change.

“The use of two different emission scenarios makes meaningful comparisons impossible. “

Reply: The SRES-scenarios have been developed for the third assessment report and used also in the fourth IPCC assessment report for the climate change projections. For the new recent IPCC assessment report, new scenarios have been developed, the RCP scenarios. Only the RCP scenarios were used for the new CMIP5/IPCC AR5 climate change projections. It is true that the two scenarios are different in many respects and that this complicates comparability. However, it was a decision by the IPCC/climate researcher community and not ours. Despite this complication, we disagree that a meaningful comparison is impossible. Quite the opposite, we believe that a comparison is not only possible, but that such a comparison is important and necessary to identify uncertainties associated with regional climate change projections and also to re-evaluate previous research and projections.

“To address uncertainty in biological or biogeochemical quantities requires more effort, because organisms will adapt but it is unclear how.”

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Reply: It is true, that changes in species composition and adaptation are not included in current Earth System models, not in the global Earth System models used for the IPCC global assessments, and not in our model. This reflects the current state of the art and limits we have in computational resources and theoretical understanding. This is of course a relevant issue and adds another source of uncertainty to future projections, one among many others. We are happy to expend on this in a revised version of the paper.

The topic of regional response of biogeochemical cycles in North Sea and Baltic Sea to climate change is far from settled. Nor has the issue of uncertainty in regional projections been investigated so far. Only a few individual studies have so far been published on biogeochemical impacts in the North Sea and Baltic Sea, and none of these is using the most recent global earth system model projections as climate forcing. This is the first study addressing this important issue, which is of relevance to the regional marine community.

Interactive comment on Biogeosciences Discuss., 12, 12229, 2015.