

Changes in the revised manuscript "A model of Fe speciation and biogeochemistry at the Tropical Eastern North Atlantic Time-series Observatory site"

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We made a number of changes in our manuscript according to the questions and suggestions by the referees. We also now compared our model results much more to observations including some unpublished data, in order to improve the contribution of our model to better understanding Fe biogeochemistry. Below is a list of the changes following the order of the chapters.

- The title of the manuscript is changed a little for better summarising the two main questions and model extensions in this study: particle aggregation and sinking, and origin and fate of organic iron-binding ligands.
- In the abstract, the focus and new findings of this study are addressed and described more clearly.

- A part of the result chapter of organic ligands is moved into the introduction as background and motivation of our model. The two main questions of this study are presented more clearly.
- The structure of the chapters of 'model description' and 'results and discussion' has been changed. Each of these chapters is arranged with subsections for the physical, biological part of the model, particle dynamics and the chemical part of the model.
- The general model setup and the setup of the physical model are described more detailed. The modelled water column is extended from the upper 400 m to 1000 m and the period of model integration is changed accordingly.
- For the biological model, we ran a large number of additional model sensitivity runs varying the ecosystem model parameters, in order to check how strongly our model results are affected by these choices. We also compared our parameter settings to a number of other ecosystem models for the region. The sensitivity runs are mentioned in the chapter describing the biological model and the outcome is presented in App. B.
- 'Particle classes and aggregation' is added as an extra subsection in the model description, in order to address the model development of this study. We complicated the classification of particles from 2 size classes to 3 and performed a set of sensitivity runs with respect to aggregation rates.
- In the subsection 'Fe speciation', we explained the choice of Fe solubility and a sensitivity study with respect to the product of Fe solubility and content in dust is shown in App. B.
- We shortened the introduction of existing knowledge on organic ligands in the subsection 'Organic ligands and complexation' and explained the estimation of

parameter values more precisely. We performed two more sensitivity studies with respect to the remineralization rate of weak organic iron-binding ligands.

- In the chapter 'Results and discussion', we included many more data to compare our model results with (including an unpublished profile of dissolved iron from the TENATSO site, thanks to Micha Rijkenberg; NIWA, New Zealand), and eliminated direct comparisons with data sets that are from outside the eastern subtropical and tropical Atlantic.
- In the subsection 'Biological conditions', we described the comparison of chlorophyll and primary production more precisely and have addressed factors possibly explaining the model-data discrepancy.
- In the subsection 'Aggregation and particle distribution and fluxes', we demonstrated the results of the sensitivity runs with respect to aggregation rates and compared them to more sediment trap measurements. We changed our formulation of the temperature dependency of organic matter remineralization to bring fluxes at depth more into line with sediment trap estimates. The paragraph about the inorganic:organic ratio in aggregates is removed, because the discrepancy to observations is eliminated by the advancements in particle classification and aggregation.
- The results of the sensitivity studies with respect to the remineralization rate of weak ligands are described in the subsection 'Organic complexation'. Here we took the ligand profile by Rue and Bruland (1995) out of the comparison and compared the modelled profile to Boye et al. (2006) and to other profiles mainly qualitatively.
- We showed the results of the sensitivity studies with respect to the redissolution of particle-adsorbed iron in 'Modelled DFe concentration' and compared our modelled DFe profile to the one iron profile at TENATSO (Rijkenberg, unpublished).

- In consequence of changing model formulations, parameter values and observations to be compared with, all model runs were redone and most numbers in the text have changed slightly. However, almost all of our qualitative conclusions are unchanged, except those relating to the composition of particles below the mixed layer.
- In general, we made our wording more clear and precise and checked again the sources for our parameter choices, and documented them better in the tables; all the equations and sensitivity studies mentioned in the manuscript are put into the 'Model description'. all the figures are redone.
- All the figures are redone. The figures No.12, 13 and 14 are removed. A figure for comparison of chlorophyll is added.