

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-106

Catherine Jeandel (Referee)

Referee comment on "Modeling the marine chromium cycle: new constraints on global-scale processes" by Frerk Pöppelmeier et al., Biogeosciences Discuss.,
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The authors propose a simulation of the Cr and Cr isotopes cycles at a global oceanic scale using the Bern3D EMIC. Despite a limited data set, they propose a well argued discussion of the sources, transformation and sink of this oceanic tracer including its redox forms (CrIII and CrVI). Although the limited set of data is narrowing the interpretation fields, leading to somehow hypothetical discussions (eg on the OMZ CrIII behavior and the Arctic specific case), the consistency between the modeled and observed data give confidence about the scientific approach. The manuscript is well written and illustrated. This work deserves publication in Biogeosciences with minor revisions as listed below.

- Riverine inputs : the authors adopt a simplified parametrization to the CrVI and CrIII removal rates in the estuaries. Although the respective values of 20% and 80% are consistent with the known behavior of these tracers, the reader is missing argument justifying this choice. In addition, the sensitivity of the model to this input term was not tested, it would have been interesting to explain why.
- The same manner, what are the arguments justifying the increase of the OMZ reduction rates to 20 and then 30 nmol/m³/y ? The way it's written looks like the authors played to the lottery which I don't think it's the case !
- The observation data base : although provided in the annex, a map representing the locations of the available (and selected) data is missing. I strongly recommend to propose a figures compiling all the stations used in this work (if I am not wrong, only few Topogulf stations are represented while the whole set of published data is listed in the excel file in annex)
- Finally, I was slightly disappointed to read that the discussion on the Med Sea results was skipped since I analyzed 3 profiles, quite homogeneous with depth and that could be compared to the North Atlantic ones : this semi-enclosed sea is a good place to test the relative influence of dust vs sediment sources.