

## ***Interactive comment on “Common features of iodate to iodide reduction amongst a diverse range of marine phytoplankton” by Helmke Hepach et al.***

### **Anonymous Referee #1**

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The authors present here a well-written study in which they studied 10 different species of phytoplankton in their ability to reduce iodate to iodide as the reaction of iodide with ozone plays an important role in the depletion of ozone in the atmosphere. It is important to better understand this biological inorganic iodine cycle in the sea surface to be able to use iodide fields in global chemical transport models. The find that in this process iodine is missing and that the stage of the senescence phase plays an important role in this reduction.

Overall the abstract is written in a confusing way in the first half and could use some clarifications, please. Whilst the second half is a lot better and the introduction is well-

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written (the first paragraph could do with some chemical equations or an overview figure for the cycle between the marine and the atmospheric parts) and the common thread becomes very clear. In my opinion the title could be improved as it is very broad and doesn't resemble the importance/most important outcome of this study. The authors nicely bring their results into perspective by comparing to the rare previous studies. Some of the figures need to be made easier for the reader and it the size will be crucial in the final paper (not too small). Some of the findings and especially the stages of the senescence phase (Fig. 9) and the missing iodine need significantly more and a thorough discussion to showcase this great dataset better, please for it to be published. Overall, I think it is a good dataset and the topic fits nicely into BGD (GBC would have been a good fit for example as well for example) and the intro and methods section are well-written. The abstract and discussion need to improved for publication. Thanks to the authors for all the work they put into this piece of work.

L13: I don't really understand the wording of iodide fields. Shouldn't first the concentration be mentioned in sea surface waters and then for the models the iodide fields? As first you need the measurements and then you can get to the fields, otherwise it doesn't make sense that you say you need more measurements in the first place, does it? Why does it only depend on sea surface iodide and not iodate as well or even total iodine as you say the iodate can be reduced to iodide and then you might need to take all of this into account? Maybe a good overview graph would be beneficial for the marine to atmosphere reaction, the chemical and the biological pathways and which you measured and why you opted for those to make it easier for the reader. The Teweis et al., 2019, PCCP paper nicely starts with one for example (different, but related). As this is a lot about the inorganic pathway you need to introduce the difference and the importance of the organic cycle in the intro, please, for the reader to understand the differences.

L14-17: Please reword these two sentences. Not an easy to read and understand abstract. I wouldn't continue from there reading this paper as too complicated like: "The

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aim of this study was to inform the development of ocean iodine cycling models...” Towards the end of the abstract it gets really well written, understandable and interesting. Thanks.

L31-41: same comment as above, either an overview graph or some chemical reaction equations would be really beneficial here as you can clearly attract significantly more readers which aren't already 100% familiar with this topic.

L57: this paper is on sea surface iodide concentrations, so please use a different reference.

L59: what about the updated version of this paper rather here for the comparisons with more data in it: Chance et al., 2019, Scientific Data?

L73: good paragraph and the last sentence is as what was missing in the abstract in regards to clarity and information why this topic is so important: “Hence we need a greater understanding of biological iodine cycling in order to develop ocean cycling models that can inform studies of ozone deposition to seawater and sea-air iodine emissions.”

L81-84: and how do the other groups/species compare and what were their rates like. Please compare better and lead the reader along in this topic. More details necessary.

L115-125: think about introducing the colours for the different groups when introducing the strains.

L126: in regards to the Tsunogai and Sase, 1969 and the possible link to the nitrate reductase and therefore the nitrate concentration wouldn't it make sense to present these here and in Table 1 or better Table2?

L130: after the reference to Bluhm et al., 2010 and the importance of the possible importance of the senescence phase- what does this then mean and wouldn't this have been crucial?

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L136: you wrote above that 450-500nM of iodine reflect the natural concentration range in seawater which means that 300-400nM is on the low end of the spectrum. Please reword sentence accordingly.

L149: into which type of bottles?

L166: why in Milli-Q and not in ESAW- what about matrix-differences with this method?

L186: two spaces: cytometry. Samples

Fig2-5 important please see comments below

L211: see comment in regards to the error or rather standard deviation below, please.

L244-266: Please move up your findings in this paragraph and then discuss it with the literature data and not the other way round.

L269: maybe it is simply not possible to group them by phytoplankton groups, but maybe other characteristics, enzymes, ... possibly the temperature, the environment, ... are more important?

L299, Fig 6: see important comment below. This needs more of a discussion and context, please.

And L309: isn't this the case as you discussed above because of a very different start concentration, doesn't this influence these plots- please, discuss this in the context of you own discussion further above.

L330: would it make sense to add the iodate/iodide concentrations to this plot to make it easier for the reader to follow the text and the differences?

L332: What about the findings by Smythe-Wright et al., in 2006, GBC and the claim made in this paper about the Mel production? Overall for this paper – what about Prochlorococcus?

L266: Please implement, explain and discuss this statement more- not clear why this

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is the case.

L374, Fig 9: great plot.

L385: Please continue the discussion on why the different phases in the senescence phase make such a difference, what this means etc. It is crucial for this paper and its importance and publication to bring this into the bigger picture. The paragraph ends pretty abruptly here and please continue.

L391: Doesn't this contradict L 266?

L411: Please further discuss the missing iodide and use chemical equation and dig into the microbiological literature as what it could be, stored depending on which species,... make suggestions and discuss this further, please. Important finding as above and needs to be expanded.

L3 and 435: Please reconsider the order of your authors. After reading the ms and having understood the substantial amount of time and efforts that went into this lab study, wouldn't it make sense that CH went last as the senior and peer-author of this study? And then that HH was the sole first author even though they contributed equally to the paper as this is what often happens?

L 625, Fig 1: Why does E. hux (RCC 4560) get a quadratic shaped symbol while all the others are dots? Wouldn't it make more sense to use different shapes in case someone prints it out in black and white?

Fig2-5: it would be nice to add the species and their symbol and colour above or into each of the graph to make it easier for the reader to spot the species shown and to compare this to Fig 1 then.

L637: usually with three triplicates you use 3 standard deviations as the analytical error and not one.

Fig 3 and 4 are too small and very hard to read being next to each other. In comparison

Fig 5 has a good size and in the final papers these really shouldn't end up being even smaller, please!

Fig2-5 have you considered the same amount of days in all of the plots and would this make the comparison for the reader easier than as it is now?

Fig6: it is not clear to me how Fig a and b can possibly look so different if a included only two additional other studies. In b the dots seem to be in totally different positions although they were supposed to be included in Fig a as well? If this is only the case because the scales are so different and pretty much a whole range of concentration is excluded then say so in the figure captions, comment, discuss this and maybe mark the square in a which is b pretty much "zoomed" in, please.

Fig7: what does this plot look like if you use the final concentration instead of just the net change? And does it make a difference? Please as commented for figure 2-5 use the colour/symbol coding throughout all your figures.

L725: Please add the concentrations for ESAW.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-443>, 2019.

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