

I have reviewed the manuscript “Medusa-Aqua system . . . “, by Pingyang Li and Tosta Tanhua and, while I find it appropriate for publication, it needs considerable modification before that. The authors describe a promising approach for continuing our ability to date ocean water masses with transient tracers as their emission histories evolve and new methods for their analysis emerge. The community faces a significant challenge in monitoring these gases in the ocean and interpreting results, as they are sequentially phased out and their atmospheric histories are no longer monotonic. Tracers useful today may not be useful tomorrow, so it is important that analytical and interpretive skills improve over time as well. This paper describes such an improvement and demonstrates its capabilities with verification in the field.

However, the manuscript is loosely written in some parts and more wordy than it needs to be. The authors need to seek out and eliminate redundant statements and tighten up the language where they can. I also worry about the organization and think it would be best to start with the instrument description, show the data, then interpret and explain it. Because of its organization, the manuscript tends to bounce the reader around rather than build a case from observations. Part of me wants to suggest that the authors write two papers – one about the method and results and one about the value of the tracers. But I think they can get this into one if it is better organized and tightened up.

Some of the figures are excellent and appropriate, while others have too much information and are not useful. The overall important message is that applying this new technology allows for the measurement of new transient tracers that will likely be useful over the next decade in understanding ocean transport. Going too far beyond that is superfluous and should be avoided.

SOME SPECIFIC SUGGESTIONS

PAGE 1

The abstract overall could be shortened. Summary statements are better in the abstract than explanations, which are in the text.

Line 13 – replace “be the most possible” with “have the greatest potential as”

Line 14 – Can these two compounds be put into the sentence above? The way it’s worded, it’s not clear what the difference between “possible” and “potential” is.

Line 15 – delete “the” after “as”

Line 32 – “most potential” is awkward. Try “the compounds that have the greatest potential as tracers in the future are . . .”

PAGE 2

Line 8 – Place “and” before SF6 and add “has been used” after SF6; replace they with both

Line 9 – replace “as are” with “and”

Line 10 – Add “are known” after “time”

Lines 13,14 – Replace “to be” with “as”

Line 27 – “solubility” is not a part of the “input history”

PAGE 3

Line 7 – Hydrolysis is not a significant mechanism for destroying CCl4 in seawater, but in some locations microbial degradation in low oxygen waters is.

Lines 9-11 – Awkward sentence; please revise.

Line 22 – Add “ing” to “discuss”

Lines 23-24 – Awkward sentence

Lines 24-25 – Incomplete sentence

Line 32 – replace “as” with “and”

Lines 33-37 – Consider tabulating these numbers instead of putting them into text.

PAGE 4

Line 2 – Add “s” to “enter”

Lines 4, 5 – Hydrolysis is only one mechanism; low hydrolysis does not rule out other possible chemical or biological removal mechanisms. Revise or delete the sentence.

Line 11 – delete “a”; add “s” to “tracer”

Line 22 – delete last sentence

Line 24 – change “target” to “targeted” (?) First sentence here is a little awkward; perhaps it can be improved.

Line 27 – delete “would”

Lines 30-36 – This structure for the paper feels awkward. Would it be better to describe the instrument first, show some results from it, and then go into the modeling and descriptions of how the data can be used? I think the paper would be easier on the reader if that approach were taken.

PAGES 5-7

Section 2.2 is good background but seems to meander. Can it be condensed and still deliver what is needed for the reader to interpret the data that are later presented?

PAGE 5

Line 22 – Add “ally” to “monotonic”

PAGE 10

Line 10 – add “s” to “standard”, delete “measurements”, replace “done” with “measured” or “analyzed”

PAGE 11

Line 1 – delete “effective”

Lines 5-9 – This could probably be deleted with no impact on the paper.

Line 9 – change “was” to “were”

Line 10 – add “s” to “depth”

Line 20 – Sentence is awkward.

Line 21 – replace “to” with “than”

PAGES 12, 13

Section 5.3 – These low values for surface saturations seem like a serious concern for the capability of the Medusa-Aqua system. Although loss during transport of samples is possible with some compounds, it is not likely for CFC-12. I hope this is not a “show-stopper”, meaning that the Medusa-Aqua system is not capable of quantitatively analyzing these compounds from seawater. The authors need to do a better job of explaining this so as not to mislead the reader about the capabilities of this system. If it has issues, what do they suggest for improving it?

Section 5.4 – It’s always difficult to follow description of a figure while reading the text and this section is no exception. I would prefer such a description to appear in the figure caption and then for the authors to use the text simply to state what the figure means. That lets the reader get on with the story and not get bogged down looking back and forth.

Section 5.5 – This discussion seems to meander about. It is not clear and it’s hard to follow. It takes several readings to get to what the authors are trying to say. What exactly are the points the authors are trying to make? I recommend they state those points and use the figure references (parenthetically) to support them. Such an approach would be good for all three of these sections.

PAGE 14

Section 6 – This section, too, meanders. Here and elsewhere (e.g., previous sections), the authors get into trouble when they start describing the content of figures (or in some cases tables) in the text. The authors would do well to consider referring to figures and tables only parenthetically, then using the text to make their important points, i.e., treat the figures much as they do references to other papers. Figure descriptions and explanations should go into the figure captions, thus freeing the authors (and readers) to engage solely in scientific meaning in the text. The idea is that text and figures should be able to stand alone. When this is done, it makes for a much easier read and quicker understanding.

Line 12 and elsewhere – The reference to number of stars is mentioned in the text without reference to their meaning. This is another example of not keeping the text and figures independently coherent. The reader should not have to refer to a figure to understand what is being said in the text, and *vice versa*.

Line 16 – Should HCFC-12 be HCFC-22?

Lines 24-26 – This reminds me that here and in the “highlights” section at the beginning of the paper, the authors refer to “potential” and “possible” as different things, but do not state how they define that difference. They may want to drop this distinction or else provide definitions for the terms.

PAGE 15

Line 15 – delete “and concentration”. Also, this sentence is a bit awkward

Line 29 – “estimating” should be “estimate”

PAGE 16

Line 3 – “estimating” should be “estimate”

Section 7 – This section needs to be more succinct. It is very important that the reader can understand immediately what the paper found. Statements about how things were done are not necessary for the conclusion, only the findings.

FIGURES AND TABLES

Figure 3 – For the purposes of this paper, I don’t believe it is necessary to show the same plot three times with different reference years. I recommend choosing one as an example to make the point that each gas has a different history that is recorded differently in the ocean.

Figure 4 – As it stands, this figure is useless. There is little to be obtained from this plethora of miniscule plots. I think the authors are trying to make the point that for any one of these gases there is some uncertainty as to their age distributions in the ocean. They can do that with one plot and a nice caption supporting it.

Figure 5 – I’m not sure this figure adds anything. If there is a point the authors are trying to make with this figure, they should do so clearly and, as for Figure 4 use one plot (maybe two, depending upon the point they are trying to make) and a clear description in the caption.

All other figures are valuable and I believe necessary to the paper.

The tables are all useful in the manuscript. In Table 2, it would be good to note whether the reproducibility is expressed as one or two sigma or if another approach is used. Tables 4 and 5 support the text, but, as noted above, the text in the manuscript needs to draw out the meaning of what these tables contain in a way that is readily understood by the reader.

FINAL NOTE: Finally, I would appreciate it if the authors would have someone else in their institute go through the final version of the next draft and catch typos, grammatical errors, etc. Independent eyes are always useful for finding things that authors miss simply because they’ve worked the text so many times.