

***Interactive comment on* “Statistical predictability of the Arctic sea ice volume anomaly: identifying predictors and optimal sampling locations” by Leandro Ponsoni et al.**

Anonymous Referee #2

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Statistical predictability of the Arctic sea ice volume anomaly: identifying predictors and optimal sampling locations. By L Ponsoni et al.

Summary statement The motivation for this study is to contribute to an Arctic observing system by identifying key locations where sea ice thickness should be measured in order to have predictability. This study contributes to predictability and also to a stakeholder need (i.e., observationalists) of developing an efficient Arctic observing network. I feel the science is strong with really interesting (and useful) results and worthy of publication. The figures are well-prepared and understandable. My main critique is that the text needs to be smoothed out and clarified. I made detailed suggestions through

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about half of the document and these comments can be applied throughout the remaining parts of the paper. I have a few interpretation suggestions in the major comments. This paper is relevant for a broad science audience so the clarity of the writing is really critical for it to be broadly accessible.

Major Comments 1) It may be very useful to include stronger arguments as to why this is a model-only study. This can be strengthened in the introduction. (Page 3 lines 10-15, expand here in a way that puts it to rest). You want to be more convincing as to why this will be applicable in real life. 2) It needs to be made clear when the models are described (bottom page 3) that these are coupled climate models and are not pegged to observed conditions. Also, Discuss the GHG scenarios used for these particular simulations because all this information will make it easier for the reader to understand the results. For climate people, these are known but this paper should be accessible by weather and observational scientists as well as potentially policy experts (since they will help formulate the Arctic observing network). 3) Beginning of Section 2.2. This first paragraph lays out the methodology. I have read it twice and it is not easily understandable. Please revise this to be more precise and direct. I am not sure what to suggest specifically. Some thoughts a. Define anomaly earlier when you refer to fig 1. Just use it here. b. Move the sentence 'Overall , two categories of predictors are tested. . . (line 18, page 5) to be the second sentence. c. Revise the first sentence of your paragraph (your topic sentence) to something like: 'Potential predictor variables are identified for the empirical statistical model that predicts SIV anomalies.' There are extra words in this sentence and the key point of the paragraph is getting lost. 4) I have some suggestions regarding the structure of the writing. a. Strengthen your 'topic sentences' that start each paragraph. This sentence should tell the reader what is in this paragraph without having to read the paragraph. The sentences in the paragraph provide the evidence or facts to support the topic sentence. This type of structure makes it easier for the reader to understand your paper quickly. 5) It is not clear to me what the time scale for the predictions is in Section 2? (re: Fig 2, Table 1). It is one-month lead? Lag-0 is what I think it is but I did not see this explained clearly. In addition,

further interpretation of the panels in Fig. 2 would be helpful because reading the 2.2 and 2.3, which refer back to Fig. 2, I see that I do not have a clear understanding or appreciation for what Fig 2 shows. It would be good to discuss each panel and provide interpretation of the panel. 6) Could OHT be a poor predictor in these models because of model biases such as too strong stratification in the Arctic ocean so that 'heat' never makes it to the upper layers? This may be worthy of the discussion. 7) Conclusions. The results are summarized very nicely in the model context. As an observationalist (BTW, I am a modeler), I would want to know how this is relevant in the real world. Some discussion on linking this to observations would be nice. I know this is not easy and I do not suggest that you do this research for this paper, but providing these insights will help you link it better to the people you want to use this work. If you can provide a framework that links this study to the observations, that would really strengthen the paper.

Minor Comments 1) Page 1, Line 24, change 'proven to bring' to 'led to' 2) Page 2, Line 1, change 'disturbance of' to 'disturbance in' 3) Page 2, line 1, split everything 'which has also ...' into a separate sentence to make it easier to understand. 4) Page 2, line 4, change 'sailing routes' to 'ship routes', not all of the ship may be sailboats. 5) Page 2, line 5, change 'At global scale' to 'Globally' 6) Page 3, line 1, change 'To the knowledge of the authors' to 'To the best of the authors' knowledge' 7) Page 3, line 15-16, change 'What are the performance ..' to 'What is the performance... ' 8) Page 3, line 17, change 'a large amount ...' to 'a substantial (e.g., 70%) of the original..' 9) Page 4, Figure 1 top panel is not even mentioned in the text. The figure panels have a and b on the right-hand side. I did not see them at first. It is standard to have them on the left corner. I suggest you edit this on all your figure panels. 10) Page 4, line 3, make it clear that the long-term trend and seasonal cycle has been removed. The text '(no long-term trend; no seasonal cycle)' is somewhat vague. Was there never a trend? It is clear from the top panel that there are trends but it is helpful for the reader if the language is unambiguous. 11) Page 5, line 7, Clarify the geographical span of the different resolution. For a student, the changing resolution is confusing. 12) Section

2.3 is written very clearly. It may be worth saying something about including SIV in the SEM. IT seems to me that SIV could dominate the results since the autocorrelation is so strong in SIV. 13) Section 2.4, numerous grammar issues in this section. This section is rough and needs revision. 14) Fig. 10, the lag/lead time for the reconstruction is not clear to me, related to comments about Fig. 1. 15) Page 22, line 30, remove 'respectively'. I do not think that is needed here because the numbers are the same as highlighted by the word 'both'.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-257>, 2019.

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