

The Cryosphere Discuss., referee comment RC2  
<https://doi.org/10.5194/tc-2022-41-RC2>, 2022  
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## Comment on tc-2022-41

Anonymous Referee #2

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Referee comment on "Predictability of Arctic Sea Ice Drift in Coupled Climate Models" by  
Simon F. Reifenberg and Helge F. Goessling, The Cryosphere Discuss.,  
<https://doi.org/10.5194/tc-2022-41-RC2>, 2022

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### Summary:

This paper explores the limits of predictability of sea ice drift in four "perfect-model" simulations, and finds that the uncertainty in the winds is the primary limit to predictability. The thickness of the sea ice in one of the four models shows a negative correlation with position uncertainty. This is an interesting paper that should be accepted after mostly minor suggestions.

### Minor Comments:

1) The ice speeds discussed in section 3, and shown in Figure 2 of 10 cm/s in the models seem really fast compared to observations which seem to be less than 5 cm/s. For example, <https://nsidc.org/cryosphere/seaice/processes/circulation.html>, shows that the typical ice speed less than 5 cm/s. And looking at some other recent papers such as Kwok, et al. 2013 (<https://doi.org/10.1002/jgrc.20191>) some similar numbers. Please discuss possible implications that the faster model speeds may have on the conclusions of this

paper.

- 2) Line 1: I think it is worth restating Nansen's rule of thumb explicitly here.
  
- 3) The paper tends to be too wordy. This and other comments below are aimed at tightening up the text. For example, on line 32, the authors write "Here, we therefore differentiate...". I would tighten this up to simply state "We differentiate...". I would comb through the paper and reduce the use of these transition words.
  
- 4) Lines 72 -93 seemed out of place. I would maybe move it up above line 58? I don't feel strongly about this.
  
- 5) Line 73, site a few "recent studies".
  
- 6) Line 81 stating "(two-dimensional)" is not necessary since this should be implied by the discussion of area.
  
- 7) Line 154: I suggest stating the "1<sup>st</sup> July" as "1 July" or "July 1<sup>st</sup>" or "the 1<sup>st</sup> of July"., then restate "1<sup>st</sup> January" in the same way.
  
- 8) Line 202: delete "which are both two-dimensional quantities".
  
- 9) Lines 205- 210: Too wordy. I think the authors can delete most of lines 206-207, and just go with lines 208-209.
  
- 10) Lines 237-238. Too wordy. I would delete the first sentence starting at line 237, and simply say "Maps of average ice thickness for the months of March and September are presented in Day et al. (2016)."
  
- 11) Line 246: delete "previously introduced".
  
- 12) Line 274: delete "In the following", and start the sentence as "We now consider the differences in the trajectories...".

- 13) Combine Figures 4 and 5.
- 14) Line 293, delete "In the following, "
- 15) Line 294 and 295: change "a (normalized) uncertainty" to "an uncertainty".
- 16) Figure 6: Capitalize "Uncertainty" under colorbar.
- 17) Line 306: delete "also".
- 18) Line 309: change "with January and July initializations" to "for January and July".
- 19) Line 334: delete "an additional point of view -".
- 20) Line 341: delete this sentence.
- 21) Line 344: change "...position here. This enables..." to "...which enables...".
- 22) Line 346: change "of normalized" to "for"
- 23) Line 436: delete "also".
- 24) Line 455: change "affect" to "cause".
- 25) Line 485-486: delete sentence starting with "Our study...".
- 26) Line 487: change "within few days" to "within a few days".