

Interactive comment on “Medium-range predictability of early summer sea ice thickness distribution in the East Siberian Sea: Importance of dynamical and thermodynamic melting processes” by Takuya Nakanowatari et al.

Anonymous Referee #1

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General Comments

The paper addresses a relevant and current topic, seasonal sea ice prediction as it pertains to increased maritime operations in northern waters in the summer season. The authors highlight the utility of the TOPAZ4 forecast system for estimating sea ice thickness distributions in the East Siberian Sea, an area that has seen increased vessel activity during summer in recent years. Sea ice thickness outputs are compared to satellite (Cryosat-2 and SMOS) and in situ (ice mass balance buoy) observations, with a negative bias of 20cm from winter to summer shown to be smaller than other model

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outputs. Skillfull predictions of sea ice thickness are limited to lead times of up to 3 days due to the influence of dynamical processes, which is somewhat expected based on similar studies and here attributed to the influence of Arctic cyclones on sea ice drift. Interestingly, the authors study the effect of thermodynamic melting processes on sea ice thickness prediction skill at longer time scales, demonstrating dependency of prediction skill on those processes. A case study of two ships is used to show how vessel speeds were related to TOPAZ4 sea ice thickness estimates in July, when ice thickness up to 150cm caused vessel blocking.

The paper is well written, the data and methods generally well described, and the results presented and discussed in a logical manner with clear figures and tables. Descriptions of data and methods are clear enough to allow repeatability.

Some further editing is needed (e.g. reference to Fig. 14 on Line 370; “There” instead of “Their” on Line 394) but otherwise there isn’t any need to make any major adjustments to the text like removing or combing sections.

Specific Comments

The title of the paper is perhaps too broad given that the focus is on the performance of the TOPAZ4 system on predictions in the East Siberian Sea, rather than an overall assessment of dynamic and thermodynamic processes on medium-range predictions.

The authors use the merged Cryosat-2/SMOS satellite-based sea ice thickness product to evaluate TOPAZ4 sea ice thickness estimates. Some qualitative statements about the uncertainty of this product are made, but more information on potential bias is needed since these data are used to assess TOPAZ4 (and PIOMAS) outputs (see Figure 2).

The authors need to be cautious about attributing model skill from a comparison between simulated sea ice thickness and limited measurements from ice mass balance buoys in a single melting season (2014). The agreement is certainly good, but the

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statement made on Lines 226-230 is not well supported given the lack of supporting data. If more comparisons are possible, they would certainly add value to the paper.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-25>, 2018.