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Interactive comment on "Interannual variability in Transpolar Drift ice thickness and potential impact of Atlantification" *by* H. Jakob Belter et al.

Anonymous Referee #2

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Review of Belter et al., "Interannual variability in Transpolar Drift ice thickness ..."

This a good and interesting piece of work that uses measured and modelled sea ice thicknesses in and around Fram Strait to diagnose an instance of the apparent impact on sea ice of potentially far-reaching changes to the Arctic Ocean, described previously as "Atlantification". While the observed case (an anomalous ice thickness year, 2016) might be called inconclusive on its own, the value of this manuscript lies, in my opinion, in its exposure of what we should expect to see (and to look for) in downstream impacts of Atlantification - downstream both from the sea ice formation regions and from the parts of the Eurasian Basin experiencing this process. I think the manuscript is worth publishing, and I only have a few minor comments and queries that I set out below, in order of occurrence.

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There's a mistake in L2 of the Abstract, which I'm sure is use of language: "most of the sea ice exits the Arctic Ocean through Fram Strait". No, most of the sea ice remains within the Arctic: an indicative Arctic sea ice volume of 15,000 km3 and a Fram Strait export flux of 3,000 km3/yr gives a residence time of 5 years (round-number estimate). The correct statement is that most of the sea ice exiting the Arctic Ocean does so through Fram Strait.

Section 2.3, minor comment. I read the first couple of paragraphs on model setup and thought "what about uncertainties in snow depth and ocean heat flux?", questions that are answered in following paragraphs. This section might read a little better if the statements of those values are joined directly to the text on the authors' approach to uncertainties.

Section 3.1.1 and description of Figure 1 (b,c): there's no indication of uncertainties here; how can we be confident that described differences are meaningful?

Section 3.1.1 on p. 8 and place names: it's usual to put place names on a map near the start of a paper; Severnaya Zemlya, Taymyr Peninsula, Laptev Sea (even Fram Strait itself). There are others elsewhere in the paper, e.g. Beaufort Sea.

Section 3.2, setup of interpretation of 2016 conditions. I am slightly uncomfortable with how this is presented. Apart from 2016, there is an approximate bias of 20-30 cm between model and measurements (measurements higher), as the authors state. Why is this? If it consistent and if there is a reasonable explanation, then the 2016 case, including the offset, and assuming that the cause of the offset also applies in 2016, shows a 70-80 cm difference between "expected" model result and measurement.

P. 11 / L239, awkward phrasing ("still investigated"); I suggest this. "Ocean heat flux is the main source of bottom melting; it is a parameter that is widely debated and is still being investigated."

L313, if you're going to mention the pandemic, you should probably say "Coronavirus"

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in full and not just "corona". Maybe the Editor can advise as to whether a reference or citation is needed here.

A small general worry about the presentation of basal melting as the cause of the 2016 anomaly (section 3.2): it might be worth presenting some simple evidence to eliminate increased heat input from above as a possible cause of the reduced sea ice thickness, e.g. by showing (or providing references that show) that insolation / cloudiness / surface air temperatures were not unusual.

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