

Interactive comment on “Variability and trends in Laptev Sea ice outflow between 1992–2011” by T. Krumpen et al.

Anonymous Referee #1

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Summary:

This paper presents an analysis of sea ice motion in the Laptev Sea and its influence on inflow and outflow. Strong coupling is found between SLP and ice motion, indicating that changes in motion are mainly due to geostrophic wind forcing. Flux out of the Laptev has increased over the decades, but there is no evidence of increasing wind velocities. Thus the increased flux is due to a change in the response of sea ice to winds, likely because of thinning and/or a decrease in concentration. Late winter flux is found to partially control the summer ice extent in the Laptev.

General Comment:

The Laptev Sea is an important source of first-year sea ice and transport from the

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Laptev into the central Arctic is an important part of the Arctic sea ice circulation. This paper presents a thorough analysis of a 20-year timeseries of ice motion and flux. This is long enough to detect a noticeable trend of increasing flux. Increasing ice motion has been noted elsewhere, as the authors reference, and their finding that the increasing flux is not associated with increasing wind forcing also commiserates other findings. Thus, this paper reinforces the conclusion that the character of the ice cover is changing (thinning, lower concentration) and this is impacting the drift of the ice cover. Although not new, this is an important result the application to the specific region of the Laptev adds to our knowledge of sea ice processes.

The finding that the late winter flux can be related to the summer extent in the Laptev is also useful and potentially beneficial to developing regional forecasts. Such forecasts are becoming of more interest as the sea ice declines and more ships traverse the waters.

The paper is well organized and well written. I recommend acceptance for publication after addressing some minor comments below.

Comments, by page and line number:

2893, 13: “consideration of” instead of “to consider”

2894, 10: “have” 2895, 16: “time-lagged”

2895,22-23: the limitations near-shore region is primarily because of the low spatial resolution of the sensor data used for the ice motion retrieval, correct? This would be worth mentioning.

2896, 8-10: reference, using the recommended citation, the NSIDC data (and the others if provided)

2896, 15-30: I find it interesting that there are differences in bias between the V and U components for the iFremer vs. ADCP and vs. SAR – in one the bias is higher vs. ADCP but lower for the other component. I’m talking about Figure 2. This is

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interesting and I'm wondering why? Why should the relative bias change depending on the component. I suspect it may be due to the grid and the mean motion relative to the grid, but I think this is worth a bit of discussion. Also, in Figure 2, the linear fit lines aren't explicitly noted in the caption. It's not too hard to figure out which is the solid line and which is the dashed line, but it would be good to put it in the caption anyway.

2898, 5: "higher than" instead of "above"

2898, 20: I'm wondering why Fram Strait flux is from a different paper? Is it the same data set? If so, then that's reasonable. But if it's a different data set, it seems like you may not be comparing consistent numbers/methods, and I wonder why not just use the iFremer data set used for the Laptev?

2899, 14 and 27-29: Figure 8 is reference before Figure 7, and 7b is referenced before 7a. The figures should come sequentially in the text.

2902, 23: "calculations" – you mean "model calculations", correct?

2908, 16: SSM/I is a sensor on DMSP platforms, not Nimbus-7. Nimbus-7 carried SMMR.

2908, 28: no comma after "February"

2911, 9: "mesoscale"

Figure 2 caption: see note above about describing the linear fit lines

Figure 3 caption: missing "s" at the end for "boundaries"

Interactive comment on The Cryosphere Discuss., 6, 2891, 2012.

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