

## ***Interactive comment on “Fram Strait sea ice export variability and September Arctic sea ice extent over the last 80 years” by L. H. Smedsrud et al.***

### **Anonymous Referee #2**

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This paper attempts to extend the time series of Fram Strait (FS) ice export back to 1935. My primary concern with this paper is the accumulated errors in their regression of ice velocities going back to 1935. Given these uncertainties, I don't think they can make any definitive conclusions based on the extrapolated time series. Details on this concern and other comments are provided below. I suggest rejection of this paper.

1) Standard error about the regression line for equation 1.

The authors state a standard error of the regression line of 3.4 cm/s. Ice velocities are typically 12 cm/s. The error adds up to an ice export uncertainty of  $\pm 250000 \text{ km}^2$ , which is also the variance about the mean of  $883000 \text{ km}^2$ . Given this uncertainty, it is hard to trust any conclusions drawn on their extrapolated time series, which is

C1

foundation of this paper.

2) Fram Strait SLP Gradient

I think the linear interpolation to estimate pressure to 78N after 1958 is probably OK since the stations are close, but prior to 1958, the southern station may be too far? The authors need to substantiate the use of the 3 weather stations on Greenland to interpolate SLP at 78N and estimate the across strait pressure gradient.

One way to do this is to compare the estimated SLP at 78N based on the regression from Nord to Danmarshavn, and Nord to Tasillaq during a period when they have data from all 3 stations.

Equation 1 should also be evaluated based on the 2 estimates of  $dp/dx$  across the strait to see how much difference the use of the different stations make.

3) The authors should cite Hilmer and Jung, 2000 “Evidence for a recent change in the link between the North Atlantic Oscillation and Arctic sea ice export”, in any discussion of Fram Strait ice flux. I think this is the definitive paper on the topic. Given that HJ cover the period going back to 1958, and many of the authors own papers discuss the period after this to the present. This paper would really have to substantiate their estimates for export prior to 1958 to make an acceptable contribution to the literature.

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C2