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Interactive comment on "Sea Ice Drift and Arch Formation in the Robeson Channel Using Daily Coverage of Sentinel-1 SAR Data During the 2016–2017 Freezing Season" *by* Mohammed E. Shokr et al.

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The objective of the manuscript is declared: "to utilize the daily Sentinel-1A/-1B SAR coverage of the Robeson Channel area ... to examine two sea ice features. The first is the drift of individual ice floes in terms of speed and direction in relation to wind data. The second is monitoring the formation of the ice arch at the inlet of the RC during its 10 days of development until maturity".

As such, putting the results of ice floe motion or the existence of the ice arch in a

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historical or geographic context is outside the scope of the study. The data used are not designed to provide such information.

The reason we did not include the tidal effect is because its frequency is twice per day while we have daily data from Sentinel-1. Hence any possible effect of tidal forces will be balanced over the daily period. Moreover, the tide will not affect the motion component along the length of the channel. Nonetheless, we will highlight this point and include brief information about the tide in the RC in a revised version.

There is quantitative information on ice floe displacement, velocity (magnitude and direction) and correlations of floe motion to wind. However, no quantitative data on the shape of the arch as it evolves. But we can include this.

The separation of the wind and current effects on floe motion cannot be addressed in this data set. We mention that this can be done using a modeling approach (not the subject of this study) and we quoted two published studies "Thorndike and Colony (1982) and Kimura and Wakatsuchi (2000)".

The new results from the study are: (1) motion of individual ice floes on daily basis, (2) the mechanism of ice arc formation. As far as we know, no similar results were published before. We will be happy to get information on published study on ice floe motion from fine-resolution SAR (not gridded ice cover) and on the effect of wind on the evolution of ice arch until it stabilizes. Previous studies estimated motion of the ice cover (not individual floes). This was done using coarse resolution (AVHRR or microwave sensors) or SAR after degrading the resolution. Ice floe motion from this study must be accurate because we traced each floe manually in the series of daily SAR image. Linking the evolution of the shape of the ice arch to wind in new. We did not see it included in any previous study.

We think the publication of this study would be timely because of the newly-launched (and future) SAR constellation missions (e.g. the Canadian RCM). The study shows that information on daily motion of individual floes can possibly be retrieved and would

be a valuable operational product if an automated method is developed to trace the floes. Daily SAR data from a constellation may be available by request only. So, results from this study can support a request to acquire daily images from RCM (for example) over an area of operational significance (e.g. parts of the Northwest Passage during summer) to support marine navigation. It is more important for marine operators to have information on the motion of individual hazardous floes than gridded motion of the ice sheet.

We appreciate the efforts of the reviewers in pointing out grammatical mistakes and wrong words. This will be corrected in a revised version.

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