

**Review of “Greenland ice velocity maps from the PROMICE project” by Anne Solgaard et al.**

This manuscript entitled “Greenland ice velocity maps from the PROMICE project” generates a time series of Greenland Ice Sheet (GIS) velocity mosaic spanning from September 2016 to present with a high temporal resolution of 24 days and a spatial resolution of 500 m based on the Sentinel-1 SAR data. In the main text, the authors introduced the data processing steps (e.g., how to extract the ice velocity and how to perform the data fusion) and the relevant error analysis (e.g., regarding the orbit error, geolocation bias correction, ionospheric effects etc.) and the validation of the results (by comparison with the in-situ GPS measurements) in detail. Overall, this manuscript was well written and organized, and the produced dataset is reliable and acceptable. And the reviewer believes that the dataset will largely contribute to the understanding of GIS ice dynamics and the behind mechanism of accelerated mass loss. Hence, this manuscript can be accepted once some issues listed below are addressed.

**General comments:**

1. With regard to the extraction of the glacier velocity when using the offset-tracking technique, the issue of how to perform the co-registration for huge amounts of SAR data, which is the most important steps for remote sensing data processing, is left out. Please clarify relevant issues, and a more detailed description is preferred.
2. For the error assessment of the final glacier velocity dataset, the offsets in ice-free areas are generally evaluated and discussed. However, this manuscript did not give relevant explanations and discussions. This information needs to be further described.
3. Some issues with respect to the formatting and written need to be revised, please see the specific comments.

**Specific comments:**

P1: In the abstract, after the location of the website, the authors added the references (Solgaard and Kusk, 2021), which corresponds to the content of this manuscript. Please confirm if this is OK?

P1, L9: Suggest that using the phrases “north-south direction” and “east-west direction” replaces the  $V_x$  and  $V_y$ .

P4, L4-6: The “Fig. 2A” and “Fig. 2B” should be changed to “Fig. 2a” and “Fig. 2b”, respectively.

P4, L4-6: Changing the phrase “See 5” to “See section 5” seems to be better. There are

several errors of this type in the main text, please check and fix them.

P5, L7-8: More information about the GIMP DEM is needed.

P5, L10: Does the term (“TPP”) have a full name? if so, please clarify.

P6: For the flow chart (i.e., Fig.3), it is just a simple and conventional description for the data processing of this study. The reviewer suggests that more detailed processes of data processing should be given in this figure. In addition, add the item related to the data co-registration.

P6, L7-9: Please add the word “section” to these expressions like “in 4.2”, “in 4.3 and 5”, “in 4.4”.

P7: For the section 4.2 (“Offset-tracking”), please add and clarify the issue of how to perform data co-registration (more information needs to be given), which is one of the most important procedures when employing the offset-tracking technique to extract the glacier velocity. In particular, for the constantly updated data, how to deal with?

P10, L15: This expression like “the range standard deviation” can easily be misunderstood. So a more clear expression like “the standard deviation in range direction” would be better. Similar issues can also be seen in Table 2, e.g., “Rang is line of sight and azimuth is along the satellite flight path”.

P13, L8: Please confirm if the units are correct? (9.7 m/s and 24.4 m/s?)

P15, L8-10: From the magnitude of the error (up to 300 m/a) caused by ionospheric effects, this item is the most significant uncertainty source. Why didn’t the authors try to apply the relevant methods mentioned in last paragraph? The reviewer thinks that developing a better or targeted method is necessary, as the author also mentioned that the post-processing step did not completely eliminate this type of error.

P15: In the section 5.5, when it comes to the error assessments, a common method of calculating the offsets over the ice-free areas is usually adopted and further analyzed. So relevant information regarding the results of ice-free areas deserved to be given.

P15, L16-17: Providing a clear explanation regarding the correct magnitude of the errors seems to be better, now that you mentioned the study of Boncori et al. (2018). Moreover, the format of the reference “in (Boncori et al., 2018)” can be changed to “in Boncori et al. (2018)”. Please check.

P16: To ensure the consistency in writing, the word “Primice” in the subtitle should be changed to “PRIMICE”.

P17, L4-6: Please add the position information about the Melville Bay and Scoresbysund areas in Fig. 2.

P23: For the Fig. 12 (also for Fig. 4), a revised figure with higher resolution is needed. Now it looks a little fuzzy.