

Interactive comment on “A 14 year dataset of in situ glacier surface velocities for a tidewater and a land-terminating glacier in Livingston Island, Antarctica” by Francisco Machío et al.

Anonymous Referee #2

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The authors present a 14-year dataset of in-situ measured surface velocities from an area in Antarctica that undergone a warming in the last decade(s). The dataset is very valuable for ice flow modeling or calibration of remotely sensed velocity fields (as already done by Otero et al., 2010; Osmanoglu et al., 2014). However, I have some comments that could help to improve the paper. As the other reviewer has already made many suggestions (that I have read, and I agree with most of them), I will try to avoid repeating suggestions.

COMMENTS

Abstract

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I think, the abstract could state that velocities are only collected during summer season. So, possible seasonal variations are not covered.

Introduction

In general I think the Introduction could better state the provided dataset was already use for tuning an ice flow model (Otero et al., 2010) and calibration of remotely sensed velocities (Osmanoglu et al., 2014)

Page1, Line 32: It is correct, that observed velocities could be used as Dirichlet BC, but I would drop this sentence, because no ice sheet modeler apply that (to my knowledge).

Page 1, Line 34/37/40: What do you mean with viscosity coefficient? In the viscosity relationships the ice hardness, effective strain hardness, a power coefficient, the effective strain rate and the enhancement factor appear. To my knowledge, the enhancement factor or the ice hardness is tuned.

Page 1, Line 34/37/40: I prefer basal friction coefficient instead of basal drag coefficient. Geographical Setting

In Fig 2, I cannot identify the stake ID EJ14 (the one, that is plotted in Fig. 3). Also, a few more locations in Fig 2 are missing, if I compare the upper right inset in Fig. 3. The same holds for Fig. 5, it seems that some velocities at the marine terminating outlet of JG are not plotted (or not available?). I prefer to show every location in Fig. 2 and the following Figures. If in the result plots velocities are not available (for whatever reason), just show it with a black.

Methods

I think, the equations could be shortened by presenting only one component in each equation (similar as Eq. 6, 7, 8).

Page 4, Line 1-4: Can you explain the choice for the locations? Were you able to maintain the stakes for 14 years? So, none of the stakes was covered with snow or

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fallen down due to melting? However, I am a bit confused, as I count more than 60 stake locations in the provided shape file.

Page 4, Line 5: Could you explain, why you take the measurements several times in each season?

Page 4, Line 6-13: Could you give a few more details about the positioning accuracy? How have you determined the tilt at each stake? And how do you get an error estimate from the tilt? As far as I understood, the positioning error does not enter the calculation of the velocity error (Eq. 7 and 8). The velocity error only depends on the polynomial interpolation. Is that right? The positioning error should also be provided in the data repository for each stake. Please use same units (m or cm) when specifying the accuracy. Just curious: In the user manual of the Trimble 5700 receiver (https://www.ngs.noaa.gov/corbin/class_description/5700-5800V2UserGuide.pdf; Page 92), I found accuracies for both modes (RTK and fast-static) that are depending on the baseline length. Have you used these formulas?

Page 4, Line 14: Please rewrite. The procedure described here does not create the surface velocity map (-> nearest neighbor interpolation, Page 10, Line 1), it describes the time interpolation. You should also somewhere motivate the polynomial interpolation. I think, it is a nice method, but I don't really see the benefit by using the interpolated velocities compared to the direct measured velocities (just extrapolate the measured displacements to meter per year).

Page 4, Eq. 3 and Table 1: Can you specify the units of the coefficients a_x , b_x and c_x ?

Page 5, Eq. 6: σ_x^2 is not explained. In the legend the vector of residuals R is missing the subscript x .

Description of datasets

In the shape file I found 26 fields instead of the 22 fields described here. I also suggest

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uploading the data for non-GIS users as a simple ascii file to the PANGAEA database. I think, the chapter could be moved to the Appendix.

Results

I recommend switching the Tables (Table 1 in the Appendix and the Table A1 in the main text), as the result of velocity calculation is the main task of this paper.

I plotted the data from the shape file in Qgis and have seen some strange behaviors (see attached figure). Most of the points are located on smooth lines/trajectories, but some outliers are observable. What is the reason for these outliers? Are these outliers considered in the velocity calculation or dropped?

In order to reduce the number of figures, I think Figure 4,5 could be overlaid on Figure 6,7.

Figures and tables

Figure 3: For colorblind people I recommend to use other colors than red and green.

Figure 4: The upper right inset marks JG instead of HG.

Figure 4,5: I suggest enlarging the arrows or plotting the velocity magnitude with different colors.

Figure 4-7: I cannot read the stake IDs. Please enlarge the stake IDs or provide a better figure quality (pdf version looks fine, but my printout not).

Table A1: The error provided is derived from Eq. 8?

For all tables, please move the caption to the top.

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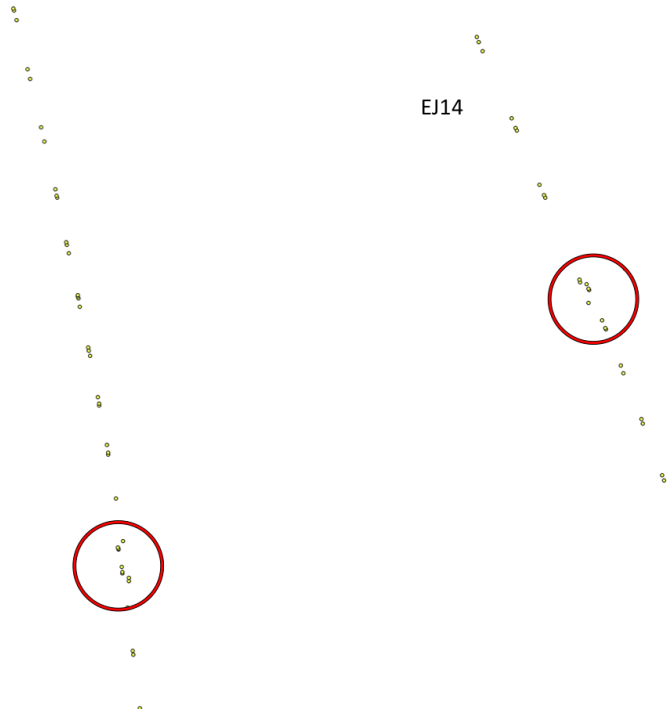


Fig. 1.