

***Interactive comment on “Twelve years of ice velocity change in Antarctica observed by RADARSAT-1 and -2 satellite radar interferometry” by B. Scheuchl et al.***

**H. A. Fricker**

hafricker@ucsd.edu

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Congratulations on an impressive piece of work. Here are some brief comments and questions from my group. We hope that you find them helpful.

General comments

The language is quite colloquial in places and the writing could do with significant tightening up throughout. For example Page 1722, Line 18 “an ice shelf flaps up and down with changes in the oceanic tide.”

It should be made clear (starting with the title) that these are two snapshots acquired

C915

12 years apart i.e. this is not a 12-year time series.

The paper covers only the FRIS and Ross ice streams, and this should be made clear in the title. Why is it not all of Antarctica? Or are these results being saved for another paper?

Methods

The description of how the velocity measurements were derived is too short and some more explanation would be helpful. I realise that this has been spelled out before in previous papers, but it would help to include the highlights of these details, so that this paper stands alone.

My group raised the following questions about the methods:

1. What is the uncertainty in the measurements? What are the sources of uncertainty with phase unwrapping vs speckle tracking?
2. How is the correction to surface parallel flow performed? Using an external DEM or differential InSAR data? How valid is this correction over ice shelves which are floating on flat water and can have undulating surfaces? This can for example be checked if overlapping data are available from different satellite look directions.
3. Is there any potential for unresolved movement perpendicular to the satellite look direction? Or are there generally multiple acquisitions from different angles such that InSAR data with unfortunate orientation can be excluded? e.g. when the flow axis deviates by more than 70 deg. from the look direction.
4. Was a correction applied for the inverse barometer effect?

Page 1723 Lines 8-9: Do you have references and examples for the width of the flexure zone varying over the tidal cycle (Section 3.3)? Our analyses of repeat-track ICESat data over the grounding zones at multiple phases of the ocean tide suggest that the width of the flexure zone does not change significantly with tidal state, unless there is

C916

an ice plain (see Figure 3 of Fricker & Padman, GRL, 2006, and Brunt et al., 2009, *Annals of Glaciology*).

Page 1725, Line 22: Have you compared these estimates for rates of slowdown with the timescale for ice stream shutdown? (e.g. Retzlaff and Bentley, 1993; Hulbe and Fahnestock, 2007).

Page 1729, Lines 1-7: The confirmation of continued slowdown of WIS is a very worthwhile result; however; Pritchard et al., (2009) actually reported that lower WIS thickened between 2003 and 2009. Upper WIS indeed thinned at the rates you posted.

Page 1729, Lines 8 – 17: This is an interesting result. Although Byrd Glacier is the only place within your study area where there is any reported connection between lake drainage and ice velocity, there are many other locations within your study area where lake drainage occurs. These include: WIS (Fricker et al., 2007); MacIS (Fricker et al., 2010); Slessor IS (Smith et al., 2009); and Recovery Glacier/Slessor IS (Smith et al., 2009; Bell et al., 2007). At a minimum, it may be worthwhile to mention that there are lakes elsewhere in the study area.

#### Figures

In Figure 1, why is the green line (the GL) not continuous?

Figure 2, the individual maps appear too small to be easily readable.

In Figure 3, is this meters per year, or meters per 12 years?

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Interactive comment on The Cryosphere Discuss., 6, 1715, 2012.