Interactive comment on “Tidally-induced velocity variations of the Beardmore Glacier, Antarctica, and their representation in satellite measurements of ice velocity” by O. J. Marsh et al.

Anonymous Referee #2

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This is a nice piece of work that I enjoyed reading.

This is to my knowledge the first such long record of tidally induced flow variations along a flow line across the grounding line on an ice stream feeding the Ross Ice Shelf. The data is therefore of great interest and very valuable for testing models of tidal response.

The authors correctly point out that based on the model by Gudmundsson, significant Msf is not to be expected because 1) semidiurnal amplitudes are small and 2) mean basal stress is large compared with expected perturbation in basal stress due to tides. As shown in Gudmundsson (2011) the o1/k1 do not produce mf response, in the same
manner as s2/k2 produce msf response. Furthermore, since there is almost no s2/k2 in the forcing it is not surprising that msf signal is not seen.

What I find missing is a direct tidal analysis of the in-line displacements. I suggest that the authors conduct a tidal analysis using some standard package such as t_tide. It would be helpful to have the a figure showing the strength of the six tidal components (o1,k1,s2,k2,mf,msf) in (detrended) horizontal displacement as a function of distance from the grounding line. This would make it much easier to follow the discussion, and it would allow for more quantitative statements about the relative sizes of the tidal constituents.

I expect that it might be difficult to solve for both msf and mf from a 35 days record (Rayleigh criterion) but t_tide will give error estimates for each component.

As suggested by reviewer #1 the paper could benefit from some restructuring. Measurement could for example better be described in a separate section on data.

Once the the authors have responded to these comments I am happy to give the paper a light re-review.

Interactive comment on The Cryosphere Discuss., 7, 1761, 2013.