The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2017-91-AC2, 2017

The Cryosphere Discussions

Interactive comment on "Recent dynamic changes on Fleming Glacier after the disintegration of Wordie Ice Shelf, Antarctic Peninsula" *by* Peter Friedl et al.

Peter Friedl et al.

peter.friedl@dlr.de

Received and published: 25 September 2017

We would like to thank the anonymous referee for the detailed and constructive review of our paper. This is just a short statement to his comments. A detailed answer together with a supplementary pdf containing the changes in the manuscript will be provided after we have received the second review. The individual points mentioned by the referee are clear and corrections of these points will contribute to a further improvement of the paper. We will address these points accordingly in a revised version of the paper. We would like to point out, that meanwhile an interesting new paper by Walker and Gardner (2017) was published that intensively investigated melt at the ice-ocean

boundary in Wordie Bay. Their investigation was coupled to global atmospheric circulation patterns. One of their key questions "Why was the response of Fleming Glacier to western Antarctic Peninsula wide periods of oceanic forcing far much stronger than the response of any other glacier in the region?" remained unanswered. Our analysis provides unprecedented details on the recent dynamic changes of Fleming Glacier. In contrast to the paper by Walker and Gardner that only analysed three stacked velocity fields from 2008, 2014 and 2015, we provide a very dense time series of satellite data for surface velocities since the availability of SAR data in the region. The data enabled us to identify two pronounced phases of acceleration for the first time: a sudden acceleration and upstream propagation of high velocities in 2008 and a phase of further gradual acceleration and upstream propagation between 2010 and 2011. Additionally, we investigate elevation changes derived from ICESsat and imaging satellite sensors, and conduct buoyancy calculations from Operation Ice Bridge data for the center of the glacier tongue. This allows us to better determine when speed-up occurred in response to ungrounding and where the new grounding line is located. Interestingly the timing of the acceleration phases is well correlated to periods of distinct warm water intrusions into Marguerite Bay, identified by Walker and Gardner (2017). Hence, our analysis provides new insights in the timing of the processes and reasons for the observed changes in Wordie Bay. Thus, our data set is highly complementary to the work by Walker and Gardner (2017) and our interpretation supports their analysis, but enabling a much better temporal constraint of the processes. We have summarized our interpretation in a small view graph (Fig. 1).

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2017-91, 2017.

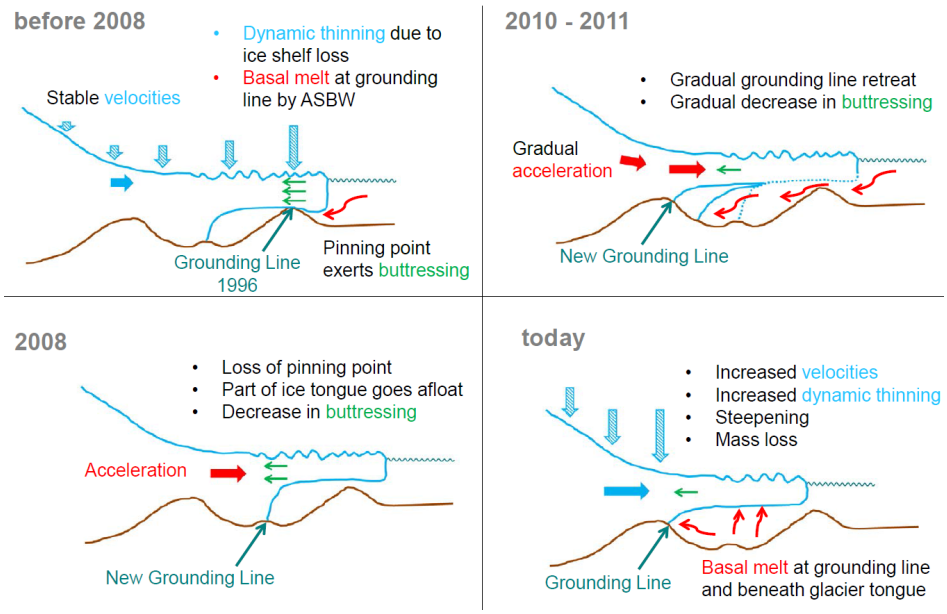
before 2008
Dynamic thinning due to ice shelf loss
Basal melt at grounding line by ASBW
Stable velocities
Grounding Line 1996
Pinning point exerts buttressing
2010 - 2011
Gradual grounding line retreat
Gradual decrease in buttressing
Gradual acceleration
New Grounding Line
2008
Loss of pinning point
Part of ice tongue goes afloat
Decrease in buttressing
Acceleration
New Grounding Line
today
Increased velocities
Increased dynamic thinning
Steepening
Mass loss
Grounding Line
Basal melt at grounding line and beneath glacier tongue

Fig. 1.