Response to Short Comment SC725

Thankyou for the helpful suggestions and comments.

Bevan et al (2012) provide a longer time series of velocity and frontal changes on key GIS outlet glaciers than previously available. This is valuable in quantifying the widespread stability of the 1985-1995 period. This is in contrast to the period of increased outlet glacier velocity and terminus change from 1995-2010 where this paper provides a valuable record of the outlet glacier temporal and spatial variability of velocity.To better illustrate the dynamic changes the authors need to better quantify for the reader the changes in velocity from the period of dynamic stability to the more recent period of dynamic variability. The important role of water depth is emphasized in the introduction in terms of ability to bring warmer ocean water in contact with the glacier. However, the water depth is not identified at the calving front for those glaciers where it is known.

We agree that water depth at the front is important but this information is not available for most glaciers making a comparison difficult. Neither would it allow a comparison of ocean heat delivery without profiles of water temperature at each location.

1646-22: There should be a Table that accompanies Figure 1 that indicates for each glacier terminus changes, mean velocity for the period of stability, and the period of acceleration and the degree of variability. Additionally it is crucial because of the dynamic importance to where possible simply identify the water depth or ice thickness at the glacier front. For example Stearn et al (2005) indicate ice thickness at the front of the Daugaard Jensen Glacier as approximately 500 meters.

1647-12: What was the stable velocity of Helheim Glacier? What is the mean acceleration for the periods after 1995/96? For each glacier it important to denote the mean stable period velocity and the mean post acceleration speed. Further this should be denoted in percentage for comparison from glacier to glacier and allows comparison with the larger data set for a shorter period from Moon et al (2012).

We have added mean speeds for the early stable period to Table 1. However, we consider that to report mean velocities for periods that contain accelerations and decelerations is misleading, especially in comparison with measurements over a different time period. Please see earlier point regarding water depths.

1651-9: It should be emphasized that Petermann and Nioghalvfjerdsbrae are the only two glaciers that do not have a maximum velocity near the terminus, and of course this is related to the large distance from the grounding line to the terminus.

Yes, will note this.

1651-15: Daugaard Jensen (DJ) should not be lumped in with Petermann and Nioghalvfjerdsbrae simply because terminus response is the same. The lack of a large floating tongue, and the evident velocity maximum at the terminus indicates that dynamically it is more like the other outlet glaciers. Why the changes are less than the other fast flowing outlet glaciers is the interesting question. Walsh et al, (2012) observe that the change in terminus position of nearby Fredriksborg and Christian IV are similar to DJ. Neither Fredriksborg or Christian IV accelerated from 2000-2010. This should be noted to emphasize that DJ is not exceptional for its region. In Walsh et al (2012) DJ is shown to have increased in velocity, whereas here the acceleration is not observed, why the difference?

We agree DJ shows obvious differences to the northern glaciers and will note this. We will cite Walsh et al. (2012) with regard to similarity of DJ to other glaciers in the region. Yes, Walsh et al. (2012) report an increase of 6.5 m/day in their Table but we do not observe this. We don't know why the difference, Walsh et al. do not refer to it in their text and yet it seems a major acceleration.