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Interactive comment on "Brief communication "The 2013 Erebus Glacier tongue calving event"" by C. L. Stevens et al.

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We thank Professor Frezzotti for his useful comments and we are pleased that he found the data interesting. The Reviewer raises several issues.

The Reviewer notes "Previous authors pointed out that the main driver of calving event were ocean waves coming from north and absence of fast ice, no data about the ocean situation is reported from the 2013 calving event, whereas the authors point out a maximum wind speed of 12 m/s, whereas weather forecasting point out strong wind on February 23." Unfortunately the weather station on Tent Island (only ∼2 km away) broke down a few weeks before the calving. The Cape Royds Automatic Weather station (20 km to the North of the EGT) recorded nothing above 10 m/s in the days prior to the calving. A new figure panel has been included as Fig 1e (included here).

The Ford Rock AWS did record high winds around this time but this is located on the Ross Shelf side of the Hut Point Peninsula and so unlikely to be as comparable to the EGT location. [amrc.ssec.wisc.edu].

The Reviewer notes "The authors suggest variability of glacier tongue velocity, but do not discussed this important issue." We agree that this important issue is worthy of more attention. In the context of the present work, the estimate of the velocity based on both Landsat images prior and posterior to the 1990 event was justified by the need of a reliable approximation of the position of the tip at the time of the 1990 event. The considerations of an ASTER image in 2010 was due to its co-occurrence with a GPS survey on the tongue at that time (Stevens et al. 2013). The use of the 2013 ASTER image to characterize the last calving allowed the second estimate of the average velocity to be obtained over the last period. Notwithstanding the potentially far-reaching implications of the documented variation in average velocity of EGT, the causes are beyond the scope of this Brief Communication.

Additionally, we believe that the contrast of average velocity between both periods remains informative if not significant and deserve to be reported. We further stress that this variation is readily resolved from the tip–vs- time figure – Fig. 2. In the original manuscript (pg 1753/line 11-13) we noted that the "From the satellite era we estimate that the speed of the tip over the period January 1989 to December 1992 was 153ma−1. It decreased to 113 ma−1 between December 2010 and February 2013. Yet in a macro-sense it needs to be moving at 200ma−1 to grow sufficiently to match records (Fig. 2c)." We have amended Fig. 2 and our 200 ma-1 estimate in the light of further examination of the satellite data. The present approach allows detailed capture of the tip position and fluctuations but to extend this further would be beyond the scope of a rapid Brief Communication. We have added in text that better contextualises the present speed in the context of the patterns described in Frezzotti (1997) as well as later sea-ice influencing iceberg break outs described in Robinson and Williams (2012) and similar measurements further north (Wuite et al. 2009). We believe the

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sub-decadal variations in speed are worthy of an in-depth study of their own.

The Reviewer notes “Authors point out a curious arrest in propagation in the 70s and 80s, but they do not use the DeLisle record of 1985.” We agree, this was an oversight on our behalf as the DeLisle et al (1989) study is an important one. It also helps fill a gap in the tip trajectory plot. The revised manuscript will include the DeLisle reference and their data plot in the revised Fig. 2 (included here). The text is augmented to note this as it is important as it supports the concept that the glacier tongue reaches some maximum length and then continually loses material through mini-calving. We thank the Reviewer for pointing this out.

The Reviewer notes “Frezzotti 1977 pointed out small calving event between 1978 and 1985”. This was initially confusing as the reference pre-dates the observations. We believe this is a typo and refers to Frezzotti (1997) which has aspects in common with the present work in that it builds a picture of Victoria Land glacier mass fluxes based on analysis of a variety of historical data. The Figure 3 in Frezzotti (1997) is an areal equivalent to the present Fig 2c and shows two data points for the Erebus Glacier Tongue in the period in question, one each in the mid 1970s and 1980s. Frezzotti (1997) notes that the glaciers of Terra Nova Bay and south experience 20-50 year fluctuations in areal extent. The revised text highlights these data points.

The Reviewer notes “The calving line of 1990 and 2013 is coincident with the most accentuated linear snow-filled depressions, these are interpreted as the surface expression of bottom crevasses and become accentuated from the generation point to the ice front and are the preferential line of major rift formation and subsequently of calving (Frezzotti et al., 1998), this is an important point for calving process and recurrence of calving should be more analysed.” We agree. A manuscript in review (Stevens et al. 2013) uses precision freeboard transects to illustrate this. This highlights a drawback of the remotely sensed observations. At least in these older data there are few data for glacier elevation structure. There is great potential in upcoming survey techniques using airborne LIDAR to elucidate this further. We now include a reference to

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Frezzotti et al. (1998) in some new text further explaining the bottom crevasses.

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Interactive comment on The Cryosphere Discuss., 7, 1749, 2013.

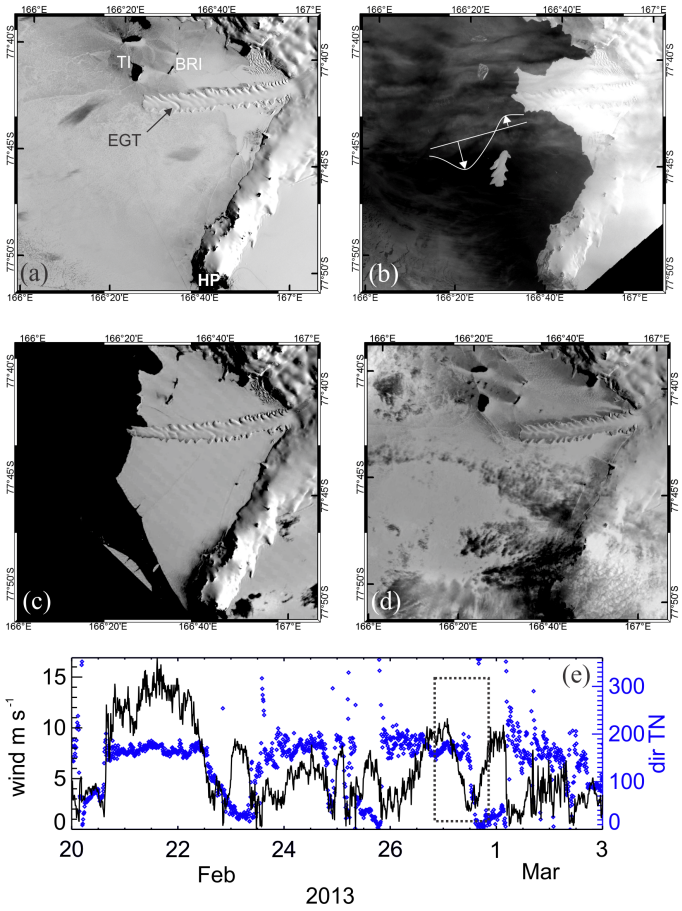

Fig. 1. revised fig with wind.

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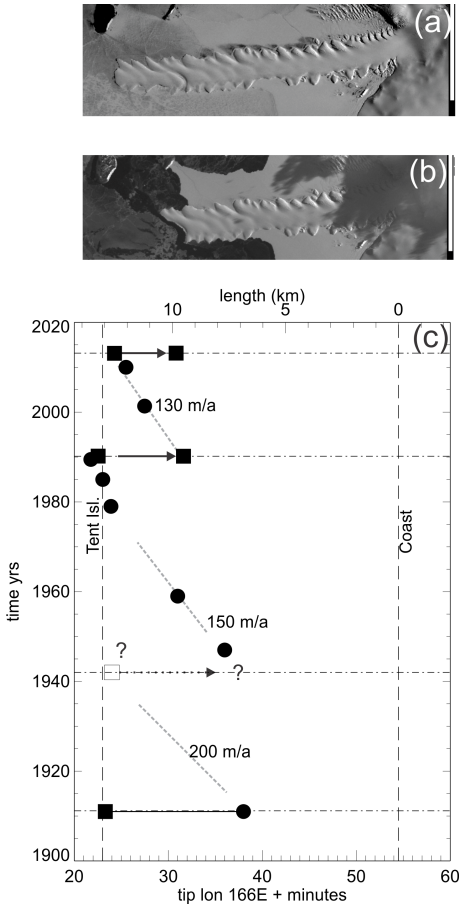

Fig. 2. revised fig

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