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The Cryosphere Discussions

Interactive comment on "A new glacier inventory for 2009 reveals spatial and temporal variability in glacier response to atmospheric warming in the Northern Antarctic Peninsula, 1988–2009" *by* B. J. Davies et al.

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Davies et al (2011) provide a valuable inventory of glacier changes on the Trinity Peninsula, James Ross Island and Vega Island. The large changes in areal extent of the glaciers are spatially and temporally documented, providing a valuable and comprehensive data set that can be easily extended in future resurveys. The largest changes are of the tidewater glaciers and these match other studies and current imagery. Comparison of changes for smaller land terminating glaciers in the northwest of Vega Island, indicate some problems. A secondary aspect of the paper is the ELA determination,

five methods are used, but none give in my view useful verifiable results for the current situation. If possible AAR values would be a more robust indicator of mass balance.

3551-13 and 3354-12: Both AAR and ELA are vital as indicators of mass balance. The ELA is generally used to determine AAR, which in turn is equated to mass balance. Given the noted spatial patchiness of the snowline and the temporal variability, AAR would be a better measure of mass balance conditions for these glaciers. The ELA-Mean approach as noted below can provide a measure of the long term ELA that generated the glacier. However, given the large scale retreat, it is clear the long term ELA is not the same as the recent mean ELA. The imagery analyzed in this project can provide a valuable measure of the AAR, if not the ELA-TSL. The ELA-Mean simply does not pass the verification test on Vega Island for assessing current ELA. The difference between ELA-Mean and recent ELA is also of value in terms of identifying the impact of the warming on glacier mass balance.

3554-18: I do not suggest that the following point be examined in detail as it goes beyond this inventory. However, somewhere in the discussion on this page reference should be made. The ELA-TSL does not provide a robust measure of the ELA for the reasons noted above. However, mapping the ELA-TSL does provide an accurate assessment of the AAR at the time of the imagery. Any one image is of limited value; however, several late ablation season images can define the typical AAR. This typical AAR even if it is not the end of the season indicates the extent and duration of typical ablation conditions, which in turn is valuable for mass balance assessment (Dyugerov , 1996; Pelto, 2011). A plot of observed AAR values would be of considerably more value for mass balance assessment than ELA-mean values derived from hypsometry. The goal would not be to determine the mean AAR or even identify the end of the melt season AAR, simply plotting the observed typical AAR on these glaciers late in the ablation season. Given the better understanding of the AAR-Ba relationship this would be of greater value than determining the ELA five different ways and applying a method based on hypsometry that does not reflect the current climate conditions. This

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methods could be applied even to a limited subset.

3555-11: The limited value of the ELA-Mean approach is indicated by the poor comparison with Bahia del Diablo (BDD). The ELA on BDD has been above 400 meters in 7 of 10 years from 2000-2009, and every year above 350 m (WGMS, 2011). Compared to the 245 m derived here. The ELA on the glaciers adjacent to BDD are comparable to these elevations. 3358-24: The base map makes it very difficult to identify the inventory numbering for Vega Island. Examining the material submitted to the GLIMS did not help. Only by going back to Rabassa et al, (1982) I was better able to determine the numbering scheme. Further it is stated that on Vega Island limited recession was apparent after 2001 on land terminating margins. Examination of 2006 Aster imagery and 2011 Landsat imagery suggests considerable recession was still occurring of land terminating glaciers in the northwest of Vega Island. In the inventory glaciers Vega Island 02-04 have shown recession and in several years have very little retained snowpack. Vega Island 28 also shows significant recession. The issues of glacier divides and margin conditions noted in Marinsek's comments also suggests further attention is needed here.

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Interactive comment on The Cryosphere Discuss., 5, 3541, 2011.