Geophysical Research Abstracts
Vol. 16, EGU2014-6601, 2014
EGU General Assembly 2014

Evaluations of new and existing methods for the quantification of tidewater glacier terminus change, and their comparability to numerical model output.

James M Lea, Douglas WF Mair, and Brice R Rea
University of Aberdeen, Department of Geography, Aberdeen, United Kingdom (j.lea@abdn.ac.uk)

Several different methodologies have previously been employed in the tracking of glacier terminus change, though a systematic comparison of these has not been undertaken. Similarly, the suitability of using the resulting data for the calibration/validation of numerical models has not been evaluated. This could be especially significant for flowline modelling of tidewater glaciers, where discrepancies between the different terminus tracking methods could potentially introduce bias into model calibrations. The choice of method for quantifying terminus change of tidewater glaciers is therefore significant from both glacier monitoring, and numerical modelling viewpoints.

In this study we evaluate three existing methodologies that have been widely used to track terminus change (the centreline, bow and box methods) against a full range of idealised glaciological scenarios, and examples of 6 real glaciers in Greenland. We also evaluate two new methodologies that aim to reduce measurement error compared to the existing methodologies, and allow direct comparison of results to those of flowline models. These are (1) a modification to the box method, that can account for termini retreating through fjords that change orientation (termed the curvilinear box method [CBM]), and (2) a method that determines the average terminus position relative to the glacier centreline using an inverse distance weighting extrapolation (termed the extrapolated centreline method [ECM]). No single method achieved complete accuracy for all scenarios though the ECM was best, being able to successfully account for variable fjord orientation, width and terminus geometry. Only results from the centreline, CBM and ECM will be directly comparable to flowline model output, though the CBM and ECM are likely to be the most accurate when applied to real world scenarios.