The Cryosphere Discuss., 6, C1061–C1063, 2012
www.the-cryosphere-discuss.net/6/C1061/2012/

The Cryosphere Discussions

Interactive comment on "Area change of glaciers in the Canadian Rocky Mountains, 1919 to 2006" *by* C. Tennant et al.

M. Pelto

mauri.pelto@nichols.edu

Received and published: 24 July 2012

Tennant et al, (2012) provide a well written, thorough and valuable inventory of glacier change in the Canadian Rocky Mountains from 1919-2006. They provide a detailed and appropriate explanation of how glacier boundaries are derived from the various map and satellite image products. They further provide extensive statistical relationships with glacier properties and climate variables. This review focusses on three key issues.

2333-12: There is an under representation of the smallest glacier class in the 1919 inventory (Fig. 6). Glaciers with an area of 0.05-0.1 km2 certainly were not all shown in the 1919 map. This needs to be acknowledged more directly. This change in representation makes the comparison of relative area change less valid, unless only a

portion of this class was used. You mention the missing glacier issue here. How did you deal with this smallest size classification in terms of comparison statistics given the underrepresentation?

2336-6: It is noted that 17 glaciers have disappeared. More details would be good. How many of the 17 disappeared by 1985 and since 1985? The size is noted, any other shared characteristics? Pelto (2010) noted that the glaciers that disappeared in the North Cascades lacked a persistent accumulation zone, which is evident in satellite imagery, and tends to occur more on slope glaciers with limited avalanching and height range. This is similar to the Jiskoot et al (2009) class 4 glaciers. Jiskoot et al (2009) were not focused on the smallest glaciers in terms of area, but the category descriptions still apply. How many would fall in this category?

2337-13: The transition to the larger population representing a broader region needs to be either removed or better explained. Bolch et al (2010) indicate a considerable difference in percentage of area lost between the BC and Alberta side of the range (11% vs 25%). Further they break the area loss percentage down by smaller regions, the changes from the central to the southern and the northern Rockies does indicate similar changes and that the extrapolation could be valid. With this variability in mind is it appropriate to say that Equation 1 can be applied to the broader region? If so demonstrate it with a bit more detail.

2341-6: The assessment of non-climate controls is warranted. A further support reference would be Pelto (2010), which indicates that it is the glaciers without a persistent accumulation zone that will not survive, regardless of size. These typically are glaciers with low slope ranges and limited avalanching. Essentially these are the class 4 glaciers of Jiskoot et al (2009) for those shrinking and class 3 for those that are not. Is this evident at all in your data set, or is it too difficult to assess at this point?

Bolch, T., Menounos, B., and Wheate, R.: Landsat-based inventory of glaciers in Western Canada, 1985–2005, Remote Sens. Environ., 114, 127–137, doi:10.1016/j.rse.2009.

Jiskoot, H., Curran, C. J., Tessler, D. L., and Shenton, L. R.: Changes in Clemenceau Icefield and Chaba Group glaciers, Canada, related to hypsometry, tributary detachment, length slope and area-aspect relations, Ann. Glaciol., 50, 133–143, 2009.

Pelto M.: Forecasting temperate alpine glacier survival from accumulation zone observations. The Cryosphere 3: 323–350, 2010.

Interactive comment on The Cryosphere Discuss., 6, 2327, 2012.