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Interactive comment on "Comparison of direct and geodetic mass balances on a multi-annual time scale" *by* A. Fischer et al.

M. Pelto

mauri.pelto@nichols.edu

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Fischer (2010) provides a useful and interesting comparison of the glaciologic and geodetic derived glacier mass balance. The value of the paper is in the detailed examination of the potential errors and in the number of glaciers and time series used. With this in mind the following suggestions are made which in general focus on encouraging a closer assessment of particular potential errors. This paper will certainly prompt further examination of the key potential errors and help those of us in determining and analyzing geodetic mass balance estimates.

1158-22: Provide a reference here this has been examined and quantified by several authors. Pay close attention to the J of Glaciology correspondence section 42(142) from 1996.

1161-17: Table 3: Maybe the most important point to reexamine is the 1967 and 1969 bgeo for HEF. This is a positive period for all Austrian glaciers and the negative -3.9 versus bdir in three years is clearly in error. The following period also has an anomalous +4.5 m for the bgeo versus direct. The obvious conclusion, though those are not always correct is that there is an error in the 1969 map or analysis. If we just look at the 1967-1979 period the record looks much better. You must either explain this discrepancy or not utilize the 1969 geodetic product for HEF.

1161-26 and Figure 6-10: A quantitative measure of the change in area for KWF or at least an area of the glacier would give the reader an idea of the magnitude of change due to crevasse closure. Though this maybe a separate study and paper. After crevasse closure surface area exposed for ablation is also reduced. Either Figure 6 or 10 could be eliminated. A single comparison vertical shot of a section of a glacier with differential crevassing would be better.

1164-5: A further figure of a mass balance map including measurements sites for one glacier would be useful, to include in discussion. This could include the geodetic points of 1893 if the EHEF or KWF is used. An idea that cannot be expected but visually would be compelling is to prepare a map to show areas of crevasse changes, densification on the map, and high basal melt for a that specific glacier.

1165-19: Miller and Pelto (1999) discuss the reduction in internal accumulation in the 1998 winter snowpack as ice lenses did not form due to a warmer snowpack, this leads to a slightly less dense snowpack, not a process that would be the main one when the snow layer thickness is actually much reduced. The tendency of mass balance losses to lead to densification is an excellent point.

1166-13: Can this be illustrated better by focusing on a specific actual point location on a specific glacier, such as on HEF for the years shown in Figure 11? The retained snow depth at the end of the past few accumulation seasons is known and the densification from Ambach (1995) for older snow could be applied.

1167-14: The lowering cannot all come from ablation it is true. How much can be explained by ablation measurements, which due exist? Also how much would a slow of inflow contribute?

1168-26: Both the South Cascade and Lemon Creek Glacier have the opposite trend to HEF. On this same point Krimmel (1999) points out that the error is believed to be in the direct methods. This should be mentioned and also the reasons for this error. The idea is that the surface mass balance is too negative on South Cascade Glacier is supported by it having by a significant margin the most negative mean annual balance of any of the 13 glaciers measured within 150 km of it, though it has a very high correlation coefficient 0.80 and higher with all of these (Pelto and Riedel, 2001). Further and Miller and Pelto (1999) point out the errors in Lemon Creek Glacier mass balance assessment are mainly near the terminus. This manifests itself in negative balance years as terminus retreat is greater and we do not measure the terminus areal extent changes each year, they are multi year extrapolations and our ablation data is less accurate the further from the snowline you get.

Figure 1-2: The captions are much too brief to fully explain.

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