Altitude variation of glacier mass balance in Scandinavia

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ABSTRACT. For each of ten glaciers in Norway and two in Sweden, vertical profiles of net balance $b_n(z)$, which are typically published as values at about a dozen altitudes, are strongly linear and nearly parallel from year to year. Separate linear functions fit the $b_n(z)$ from year to year with $r^2 \geq 0.89$ over the 12 glaciers. A family of parallel lines for each glacier that differ from year to year only by an amount Δb_n constant with altitude has $r^2 \geq 0.85$. There is an altitude z' on each glacier where the measured balance $b_n(z')$ correlates well with the glacier-total b_n with $r \geq 0.97$ over the 12 glaciers. A remarkable consequence of this and of the high correlation of b_n between many of the glaciers in the region is that measurements on one glacier (1775 meters on Hardangerjøkulen) provide a good estimate of b_n at several other glaciers.