



Comparison of volumetric changes and in-situ mass balance measurements at Storglaciären, Sweden

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The documentation of glacier changes is a key element for the reconstruction of past climate variability and early detection of global climate changes. Among the essential variables required for global climate monitoring, glacier mass balance is the direct and undelayed signal to annual atmospheric conditions. On Storglaciären in the Tarfala Valley, Sweden, annual mass balance measurements with the direct glaciological method, based on an extensive net of ablation stakes and snow pits, were initiated in 1945 with continuous measurements until present. In addition, comparisons of the in-situ mass balance measurements with volume change analysis from topographic maps are available. However, a validation of the glacier mass change with volumetric changes from multiannual digital terrain models (DTMs) - derived from photogrammetric analyses - has not been done so far. Within international monitoring strategies, the combination of direct glaciological and remote sensing methods has been proven to be a feasible approach providing relevant results. In this study, aerial photographs of the years 1959, 1969, 1980, 1990, and 1999 are analysed photogrammetrically for the compilation of orthoimages and DTMs. By the comparison of multiannual DTMs, volumetric changes of Storglaciären are quantified and analysed for the corresponding periods. These data are compared to in-situ mass balance measurements recorded annually (1946-2005) as well as to existing volumetric change analyses based on topographic maps. In addition, other glaciological features like front variations and changes of the moraines are documented by the comparison of orthoim-

ages and DTMs.