



Spatially distributed reconstruction of the surface mass balance of Pasterze glacier, Austria, employing a full Stokes model

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The Pasterze glacier is the largest Austrian glacier (17.7 km², 2003) based in the 'Hohe Tauern' region of the Eastern Alps. In the period from 1980 to 1997, surface mass balance (SMB) measurements were carried out by the Verbund-Austrian Hydro Power (AHP) Company. Since 2004 SMB measurements of the Pasterze glacier were reinstalled by the ZAMG using the glaciological method (stakes, snow pits, ...). Current specific SMB rates correspond to a mean surface ice loss of ~1.5 m per balance year. Since 2005 kinematics of the ablation stakes have been determined through regular differential GPS surveys. Based on the high spatial sampling by the installed ablation stake network (~50-60 stakes), a high quality ablation and flow velocity data set has been gathered for the ablation area of the Pasterze glacier. As a next step we deployed a full stress computational model (<http://elmerice.elmerfem.org>) to investigate the dynamics of Pasterze glacier. We employed a high resolution digital elevation model (DEM) of the bedrock and high quality DEM's of the surface taken at different times (1969, 1998, 2012) as input for diagnostic simulations. After tuning the model parameters (e.g. sliding) to the in-situ determined dynamics, we reconstructed the spatial SMB distribution of the glacier and compared it to the measurements. The reconstruction of the SMB from diagnostic simulations can be an effective technique in order to - on top of measurements that usually are confined to centre-lines of glaciers - get additional information on the spatial SMB distribution by utilizing easier accessible surface DEM's as well as for SMB homogenization approaches.