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Measuring and modelling the energy and mass balance of Storbreen, Norway.

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Storbreen is situated in the continental part of Norway and has one of the longest mass balance series in the world. Annual measurements of accumulation and ablation have been carried out since 1949, providing a total of 56 years of measurements. Except for a transient mass surplus in the period 1989-1995, the main trend has been mass deficit and the glacier had a total mass loss of -15 m w.e. for the period 1949-2004. The mean summer balance (-1.7 m w.e.) exceeds the mean winter balance (1.4 m w.e.). Generally, the summer balance values have a larger variability than the winter balance values.

In order to study the spatial distribution of the energy and mass balance at Storbreen, a two- dimensional mass balance model has been applied to the glacier. The model takes into account shading and topography and calculates the energy flux at the surface for each 25 m grid cell. Data from an automatic weather station (AWS) operating in the ablation zone since 2001 has been used to calibrate and validate the model. Meteorological stations outside the glacier provide input data for the model. Storbreen has a complex geometry where winter accumulation especially is influenced by the surface topography. Therefore, the annual measurements of winter accumulation have been used to find a characteristic pattern that is used to redistribute the precipitation in the model. Modelled specific mass balance has been compared with measured mass balance, and shows good agreement. However, poorer agreement was found for some years where measurements deviated significantly from the mean.