



Seasonal and interannual variations in snow cover thickness, glacier mass balance, and gravity-induced dynamics in a high Arctic valley glacier watershed.

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For 3 consecutive years, terrestrial laser scanning surveys have been conducted in the glacier basin of Austre Lovénbreen (Svalbard, 79°N). Each year, high density point clouds were acquired on the glacier surface and on the surrounding slopes. Two yearly scanning sessions were required in order to spatialize and quantify snow cover. The first session was done late April at the expected annual snow maximum. The second session was done in August near the end of the melting season.

On the glacier itself, laser scans were produced on the glacier snout, in the area close to the equilibrium line, and in the upper reaches of the glacier. Manual snow drilling measurements and glacier mass balance data were subsequently used to validate snow cover results.

In the steep slopes surrounding the glacier, scans were acquired on slopes at various altitudes and orientations in order to get a representative view of different snow cover settings. Particular attention was granted to snowdrift and avalanche processes, and their consequences on remaining packed snow stored in perennial snow accumulation at the bottom of slopes.

A good knowledge of the dynamics of the snow cover is of particular interest in a glacier undergoing a clear retreat. Snow is protecting the ice from melting for part of the season, and snow is also providing what will constitute future glacier ice in the upper reaches of the basin.

Snow on slopes is also of importance as avalanches reaching on the glacier can contribute to the overall mass balance. Snow cover, by keeping the slopes permafrost from thawing early in the season, or by providing liquid water affecting it later in the season, is also playing a key role in the glacier basin morphology and its interactions with the glacier body.