



The mass balance of the Austfonna Ice Cap, Svalbard, 2004-2010

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As part of the IPY GLACIODYN project (The response of Arctic glaciers to global warming) the mass balance of the Austfonna Ice Cap has been studied. The Austfonna ice cap (8120 km²) is by far the largest ice cap in Svalbard and one of the largest in the Arctic. Studies have been focused on 1) Surface mass balance by direct measurements 2) Geodetic mass balance from elevation changes by ICESat satellite data, airborne laser profiles and ground-based GPS 3) Dynamics; surge and calving.

The surface mass balance has been measured by traditional, direct method, by about 20 stakes over the ice caps, by snow soundings, snow pits and GPR profiles of the snow distribution.

The net surface mass balance on Austfonna is slightly negative (-0.1 m water eq. y⁻¹) for the period 2004-2010. The mean specific winter accumulation is only 0.52 m w.eq. y⁻¹, and the mean summer melting has been -0.63 m w.eq. y⁻¹. These numbers are not precise since accumulation may occur also during the summer months. It is not possible to give any trend for the data for only seven years. 2004 was the most negative year, while 2008 was the only year with positive surface mass balance. The surface mass balance results fits quite well with former estimates from shallow ice cores giving close to zero surface mass balance for the period 1986-1999. This indicates only small changes in the entire period 1986-2010. There is no sign of increased melt-rate over the measured period.

The elevation change measurements on Austfonna derived from ICESat data 2003-2008 show a thickening in the interior of c. 0.5 m y⁻¹, and a thinning closer to the coast of 1-2 m y⁻¹, indicating a large dynamic instability. The calculated geodetic net mass balance is very close to zero.

The calving is important (2.5 ± 0.5 Gt y⁻¹) and stands for 30-40 % of the total mass loss, giving an overall negative mass balance of -0.4 ± 0.1 m w.eq. y⁻¹.