



Response of glacier mass balance to regional warming, deduced by remote sensing on three glaciers in S-Iceland

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We assess the mass balance changes of three ice caps in South Iceland, for two periods, 1980 to 1998 and 1998 to 2004, by comparing digital elevation models (DEMs) covering the entire glaciers; Eyjafjallajökull (81 km²), Tindfjallajökull (15 km²) and Torfajökull (14 km²). The DEMs were compiled by i) using aerial photographs taken between 1979 to 1984 by the American Defense Map Agency (DMA) and the Icelandic Geodetic Survey, ii) using airborne EMISAR radar images obtained in 1998 by the Electromagnetic system (EMI) of the Technical University of Denmark, and iii) using two image pairs from the SPOT5 high resolution stereoscopic (HRS) instrument from 2004. The ice-free part of the EMISAR-DEM (5x5 m spatial resolution with accuracy <2 m in elevation) was used as a reference map for co-registering and offset-correction of the HRS-DEMs (40x40 m) and the DMA-DEMs (40x40 m interpolated from 20 m contour lines). The average specific mass balance was estimated as the mean elevation difference between glaciated areas of the DEMs. The glacier mass balance declined significantly between the two periods: from -0.2 to 0.2 m yr⁻¹ w. eq. during first period 1979/1984-1998 to -1.8 to -1.5 m yr⁻¹ w. eq. for the more recent period 1998 to 2004. This declining mass balance take place at the same time as the average regional temperatures increased by ~1 °C from the first to the second period (1980-1998 to 1998 to 2004).