12.2 Meteorological measurements

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From September 2007 until August 2010, an automatic weather station (AWS) has been operating at 650 m a.s.l. in the ablation area of Langfjordjøkelen (Fig. 12-2), as a contribution to the International Polar Year (Glaciodyn). The station (Fig. 12-6) was owned and maintained by the Institute for Marine and Atmospheric research Utrecht (IMAU), Utrecht University (contact: J.Oerlemans@uu.nl). The station recorded shortwave and longwave radiation (incoming and outgoing), air temperature, relative humidity, wind speed and direction, air pressure and distance to the surface. Sampling was done every few minutes (depending on the sensor) and 30-minute averages were stored. The measurements will be used to study the local microclimate at Langfjordjøkelen and to calibrate a mass balance model for the ice cap. Here, we present a selection of the data collected over the three-year period.

Figure 12-6
The AWS site on Langfjordjøkelen on 26th August, 2008. A second sonic ranger, measuring the distance to the surface, is on the tripod to the left of the mast. Photo: Rianne H. Giesen.

Surface height change and albedo

For the major part of the three-year period, the surface at the AWS consisted of snow (Fig. 12-7). The underlying ice generally surfaced in the last days of July and the winter snowpack started to build up again between the end of September and the end of October. Maximum winter snow depth was approximately 3.5 m in all three winters. Over the three-year period, almost 6 m of ice melted at the AWS location, which corresponds well to the mass balance measurements at the nearby NVE stake.

The surface albedo was calculated from measured incoming and reflected solar radiation. Between early November and early February, no or very little incoming solar radiation reached the sensor and albedo could not be calculated. Surface albedo was high in winter, when frequent snowfalls occurred. When the snow surface started to melt, surface albedo decreased to values around 0.7. During the short periods with bare ice at the surface, the albedo at the AWS location varied between 0.25 and 0.30.

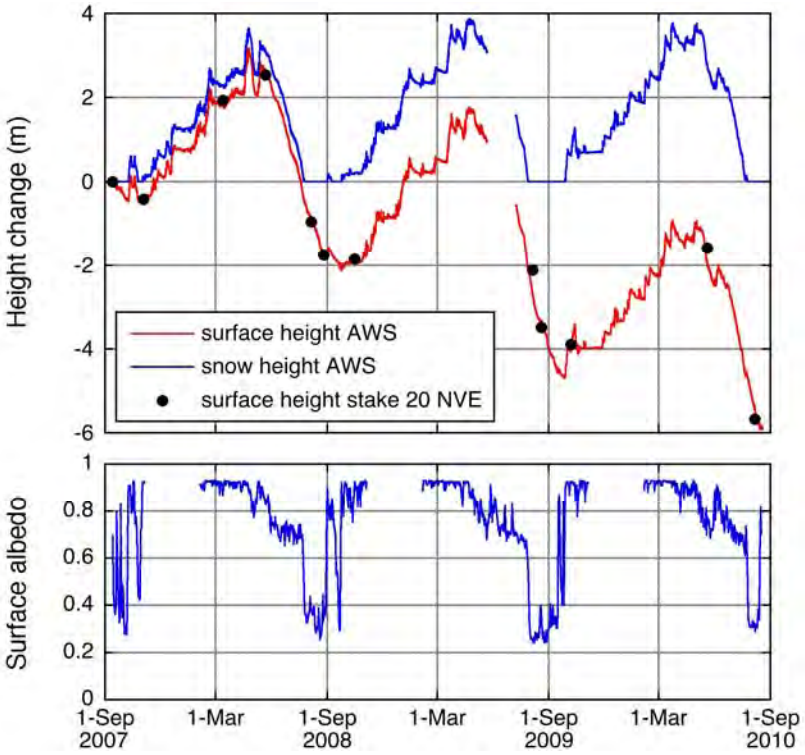

Figure 12-7
Daily mean values of surface height (AWS and nearest NVE mass balance stake) and snow height (upper), and surface albedo (lower) for the period September 2007 to September 2010.

Air temperature

Figure 12-8 shows daily mean air temperature together with a two-year record from a second AWS, which is operated by NVE and is situated on a rock surface above the glacier at an altitude of 910 m a.s.l. (Fig. 12-2). The mean air temperature at the IMAU AWS was −1.0 °C. For the period with data from both AWSs, the mean temperatures at the IMAU and NVE AWSs were −0.7 °C and −2.3 °C, respectively. The highest temperatures over the three-year period were recorded in the summer of 2009, while the lowest temperatures were measured in the first months of 2010. Even in mid-winter, daily mean air temperatures were occasionally higher than 0 °C.

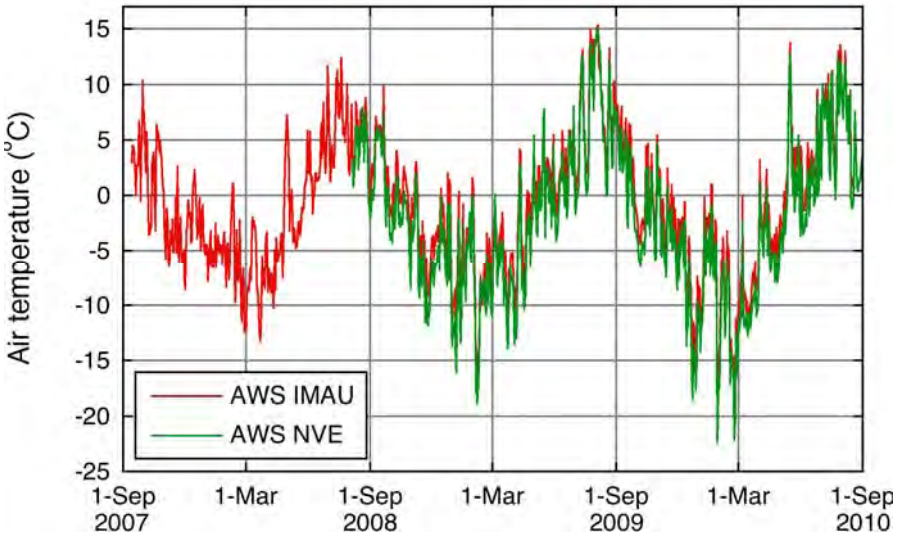

Figure 12-8
Daily mean air temperature at the AWSs operated by IMAU and NVE for the period September 2007 to September 2010.