



An automatic snow station experiment in Western Dronning Maud Land, Antarctica

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Snow and ice cover 98% of all surfaces in Antarctica and it is one of the principal components of our global climate system. Snow properties easily respond to changes in environmental conditions and therefore studying the spatio-temporal variations in the physical properties of Antarctic snow cover is crucial. We present here results from a snow station experiment recording the temperature evolution of the snow surface layer over one year in two stations. The snow stations were installed in December 2009 to measure the snow temperature at 15 different depths for one year, the deepest sensor being at 4 m at the moment of installation. The stations were recovered in January 2011 and both were still fully operational. It was the first time when this kind of experiment was successful in the western Dronning Maud Land. The stations were located 50 km (station 1) and 10 km (station 2) from the Finnish research station Aboa ($73^{\circ} 02.5'S$, $013^{\circ}24.4'W$), 80 and 130 km south of the ice shelf edge. The temperature data are analyzed for the annual temperature cycle of surface layer temperature, surface heat budget, and net snow accumulation. The power spectra of temperature at the depth of 54 cm were calculated for the whole measurement interval, and separately for the polar night and polar day seasons. The daily cycle was strong during the polar day but disappeared when the polar night started. The daily cycle is also seen when looking over the whole measurement interval. Also physical characterization of the snow stratigraphy was made at the installation sites at the start and end of the recordings, including thickness, density, hardness (hand test), and grain size and shape (photographs from crystals). Also the dielectric constant was measured using the Snow Fork (designed and manufactured by Toikka Oy) to estimate the liquid water content (wetness).