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ESTIMATING LONG-TERM EAST ANTARCTIC SNOW ACCUMULATION FROM AUTOMATIC WEATHER STATION DATA

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The Australian Antarctic Division has operated automatic weather stations (AWS) at a number of sites on the East Antarctica ice sheet for various periods of time since 1984. These AWS measure air temperature and wind speed at three levels above the surface, nominally 1 m, 2 m and 4 m when the stations are first installed. With time the stations slowly become buried by snow accumulation, and the meteorological data enable the time that the sensors are buried to be identified, thus providing a proxy record of snow accumulation rate. The temperature sensor response to burial is a pronounced damping of the diurnal record (most obvious in summer) and at sites where the burial is rapid, the date of sensor burial can usually be estimated to within a week or two. At other sites, the interpretation of burial can be complicated by partial burial, or burial followed by excavation of the sensor by wind erosion. Estimation of the time of burial is best defined using the absolute value of the change in temperature with time ($|dT/dt|$). This has been done at eight sites, resulting in accumulation rate observations spanning from three to 17 years.

Seven of the more recent AWS installations have included a sonic ranging sensor, providing (near) continuous monitoring of snow surface height. These data have a resolution of one centimetre. The distance measured is a function of accumulation as well as ablation, densification and snow redistribution by drift. Individual accumulation events are estimated from these data after filtering to remove isolated high frequency changes, and are used to estimate total annual accumulation and the seasonal variability. The AWS estimates of snow accumulation are compared with those from traditional stake and firn core measurements, and with estimates from atmospheric models,