



Estimation of Snow Accumulation in Antarctica Using Automated Acoustic Depth Gauge Measurements

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Antarctica is a continent of many meteorological unknowns, the most significant of which is the temporal and spatial distribution of precipitation. Traditional methods of quantifying precipitation, such as estimates from microwave sounders, snow gauges, or radar are not feasible or not available in Antarctica at the present time. Consequently, the amount of accumulation at a given site, whether by blowing snow or falling precipitation, remains largely unknown. Acoustic depth gauges (ADG) provide the only concrete real-time information for accumulation in Antarctica. However, ADGs only measure snow depth change, and not precipitation. The real issue is deriving how much precipitation is a factor in changes of snow depth observed from the acoustic depth gauges. The focus of this project is to evaluate the usefulness of continuous automated snow depth measurements for the purpose of measuring precipitation. There are two specific goals of this work - 1) to determine if the accumulation of snow at a given observation site is significantly affected by the horizontal transport of snow; and 2) to determine if measurements of snow depth change are sufficient to define precipitation patterns. This project, lasting from 2003-2006, resulted in the placement of eight ADG sensors mounted on board automatic weather stations (AWS) at several locations across Antarctica. Using information from the AWS, ADG, and other measurements collected, preliminary studies on expected causes of accumulation at each station was conducted. For some events, causes of snow depth change were able to be determined, but for most events, the causes of snow depth change were unknown. The results suggested that observation of snow depth change alone was not sufficient to determine precipitation. However, closer examination of the measurements suggested that when depth observations were combined with other measurements, the potential exists to accurately estimate the precipitating snow contribution to depth change.