A Solar Warming Model (SWarm) to Estimate Diurnal Changes in Near-Surface Snowpack Temperatures for Back-Country Avalanche Forecasting

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Diurnal temperature fluctuations occur in near-surface snowpack layers as a result of the energy balance at the snow surface. While there is some understanding of these temperature fluctuations and their effects on snowpack stability, quantified estimates of their magnitude are not readily available to avalanche forecasters in western Canada. During the winters of 2005 and 2006, near-surface temperatures were measured on a knoll located in the Columbia Mountains of British Columbia. The field dataset was used to develop a near-surface warming model, based on linear regression analysis of predictor variables derived from surface energy flux terms. To facilitate use in large forecast areas where representative meteorological data are typically scarce, consideration was given to the availability of input data. Based on slope, aspect, expected cloud cover and number of days since snowfall, the model predicts the magnitude of near-surface daytime warming with an estimated root mean square error of 1.6 ^{o}C.