Computation of Canadian Gridded Snowfall Based on Rehabilitated Station Data

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ABSTRACT

Snowfall variability maps can be used for several purposes (climate change detection, hydrological, regional climate model validation purposes, etc.), but gridded monthly or seasonal snow derivation is very difficult because of the uneven distribution of the snow within the year. The indirect approach presented here for creation of gridded snowfall is based on the new rehabilitated station precipitation data; the gridded precipitation normals computed at University of Waterloo (Soulis et al., 1994) are also used.

The first part of the presentation will summarize the derivation of rehabilitated daily snow and rain data. A total of 491 carefully selected stations, most covering the period 1900–present were used. Data availability in much of the Canadian Arctic is restricted to 1948–present. By using a daily time-interval, improved corrections to rain and snow data could be implemented. For each of the three rain gauge types, corrections to account for wind undercatch, wetting loss, and evaporation were applied. For snowfall, ruler measurements were used throughout the time series, to minimize potential discontinuities introduced by the adoption of Nipher shielded snow gauge measurements in the mid-1960s. Density corrections based upon coincident ruler and Nipher measurements were applied to all ruler measurements. Where necessary, records from neighboring stations were joined employing a technique based on a simple ratio of observations. Annual and seasonal graphs of national and north of 55°N time series will be presented.

The second part of the presentation will summarize the snow grid map derivation and evaluate the efficiency and applicability of the method. Spring as a shoulder season was selected for the first snow grid map. The direct statistical computation of the snow grid network is nearly impossible due to the occasional occurrence of zero events during the year. However seasonal precipitation anomalies can easily be calculated and gridded using Gandin statistical optimal interpolation based on the rehabilitated station information (Milewska and Hogg, 1998). Gridded seasonal precipitation normals are also available, the normals are computed on the same set of rehabilitated precipitation data, including additional important factors (such as latitude, elevation, slope, etc.). The actual gridded seasonal total precipitation values can be derived by joining the two maps together. The next step is the station and gridded seasonal snow to total precipitation ratio computation. The actual gridded seasonal snow field is the multiplication of the actual seasonal total precipitation and the seasonal snow to total precipitation ratio grid values. The quality of gridded snowfall is cross-validated on a selected subset of evenly distributed stations.

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REFERENCES
