Transfer Function Development for Adjusting Precipitation Observations in Arctic and Maritime Climate Conditions

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ABSTRACT

The replacement of manual rain and snow observations with automated gauges is a difficult challenge for the user community and is leading to extensive research of these new instruments, installations, and measurements with the objective to quantify any underestimation and adjust the measurement bias. Key users, such as Numerical Weather Prediction (NWP) and Canadian Precipitation Analysis (CaPA) have identified the need to develop and apply transfer functions (TF) for precipitation gauge wind bias adjustments applicable for diverse Canadian climates. The WMO Solid Precipitation Inter-Comparison Experiment (SPICE) developed eight site-specific and one universal TF for the adjustment of solid precipitation measurements using data representing five different climate zones, namely Alpine, Northern Boreal, wet and dry Continental and Maritime climate. Transfer function development requires the availability of a Double-Fence Automated Reference (DFAR) installation for use as the reference precipitation observation in the estimation. Further to the three Canadian supersites that participated in the WMO-SPICE intercomparison experiment, two more locations in Canada with overlapping reference gauge observations are available. The Iqaluit supersite in Nunavut represents a typical Arctic climate with low snowfall amounts, cold temperatures, and blowing snow conditions, while the St John's site in Newfoundland has a maritime climate with high winds and frequent light and mixed precipitation conditions.

The focus of this presentation is to estimate the TF for all possible existing configurations [single Alter-shielded / unshielded / Belfort double Alter-shielded Geonor or Pluvio2 gauges] at Iqaluit and St John's sites. The major steps include 1) process and quality control all precipitation gauge, wind, temperature, and disdrometer data; 2) aggregate high frequency data to 30-minute and 60-minute intervals; 3) estimate transfer function parameters; and 4) validate the results. At the end, the results will be compared to the existing WMO-SPICE transfer functions and the possibility of applying climate dependent transfer functions across the Canadian networks will also be examined.

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