



The Canadian Precipitation Analysis (CaPA): Evaluation of the statistical interpolation scheme

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CaPA (Canadian Precipitation Analysis) is a data assimilation system which employs statistical interpolation to combine observed precipitation with gridded precipitation fields produced by Environment Canada's Global Environmental Multiscale (GEM) climate model into a final gridded precipitation analysis. Precipitation is important in many fields and applications, including agricultural water management projects, flood control programs, and hydroelectric power generation planning. Precipitation is a key input to hydrological models, and there is a desire to have access to the best available information about precipitation in time and space. The principal goal of CaPA is to produce this type of information.

In order to perform the necessary statistical interpolation, CaPA requires the estimation of a semi-variogram. This semi-variogram is used to describe the spatial correlations between precipitation innovations, defined as the observed precipitation amounts minus the GEM forecasted amounts predicted at the observation locations. Currently, CaPA uses a single isotropic variogram across the entire analysis domain. The present project investigates the implications of this choice by first conducting a basic variographic analysis of precipitation innovation data across the Canadian prairies, with specific interest in identifying and quantifying potential anisotropy within the domain. This focus is further expanded by identifying the effect of storm type on the variogram. The ultimate goal of the variographic analysis is to develop improved semi-variograms for CaPA that better capture the spatial complexities of precipitation over the Canadian prairies.

CaPA presently applies a Box-Cox data transformation to both the observations and the GEM data, prior to the calculation of the innovations. The data transformation is necessary to satisfy the normal distribution assumption, but introduces a significant bias. The second part of the investigation aims at devising a bias correction scheme based on a moving-window averaging technique.

For both the variogram and bias correction components of this investigation, a series of trial runs are conducted to evaluate the impact of these changes on the resulting CaPA precipitation analyses.