Comparison of gridding methods for monthly precipitation for trend analysis in Canada

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During the last couple of decades, Canada's national and regional climate trend assessment has been based on a set of gridded temperature and precipitation monthly anomalies, known as the Canadian Gridded (CanGRD) data, which were produced using Optimal Interpolation (OI). In CanGRD, temperature anomalies and normalized precipitation anomalies at 463 stations of the Adjusted/Homogenized Canadian Climate Data (AHCCD) are interpolated to a 50-km equal-area grid over Canada. The input AHCCD precipitation data had been previously adjusted for known problems such as wind-induced gauge undercatch, wetting loss, and trace amounts; and joined stations series were also tested and adjusted. However, the performance of the CanGRD gridding method (i.e., the OI method) has never been evaluated against other gridding methods. The objective of this study is to evaluate CanGRD method against an ordinary kriging (KG) method. To this end, an observation-based ANUSPLIN-gridded monthly precipitation dataset (which is based on precipitation data from 3000+ stations) was used as the truth dataset, and ANUSPLIN estimates of monthly precipitation amounts at the 463 AHCCD stations were used as input data to the gridding models. In search for a better way to use KG, we took two approaches to apply KG: (1) KG-GP approach, in which KG was applied directly to the monthly total precipitation amounts; and (2) KG-GNGA approach, in which KG was applied separately to the monthly normals (for each calendar month) and the monthly anomalies. The gridded normals (GN) and the gridded anomalies (GA) were then combined together (GN+GA) for comparison with the gridded precipitation (GP) from the KG-GP approach to find out which of the two approaches is more skillful. The gridded anomalies (GA) from the KG-GNGA approach is comparable, and was compared with the CanGRD data, noting that in the CanGRD method, the anomalies rather than precipitation totals are gridded. In both evaluations, the gridded datasets were compared against their counterparts derived from the truth dataset using skill measurements such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and Pattern Correlation Score (PCS). The results show that (1) the KG-GNGA approach notably outperforms the KG-GP approach, and (2) the KG-GNGA method significantly outperforms the OI method used in CanGRD. This study is being expanded to include other gridding methods in the comparison.