

Review ESSD-2018-128 Acronym soup reanalysis for Canada hydrology

The authors have provided a short clear outline of their combination of two Canada-focused forecast or forecast-amended-by-observation products (GEM and CaPA, respectively) with a global ECMWF reanalysis. However, the project and manuscript omit major steps necessary to make the data useful to readers and to qualify the description for ESSD. A valid data set for ESSD requires validation and quantitative uncertainty analysis. This manuscript presents neither.

First, from what we are given, evidently the demonstration outcome covers the “entire Mackenzie River basin” (line 186) but only that basin. First, does basin in this case equate to watershed? Or to a larger more general region defined by hydrography or ecology? Figures 3 and 4 apply only to this Mackenzie basin? Why only this basin? What does the outcome look like in eastern Canada? In the Canadian Rockies or BC? We need quantitative performance measures for multiple regions as well as for the entire area of coverage.

We do not get, but must have in order to develop confidence in the product, validation. We read about bias in the ECMWF product with respect to Canada (e.g. line 112) but for what parameters? Wind, precip, all parameters? Region-specific or Canada-wide? We never, however, find any attempt at validation of the combined product to a) show improvements over those previous but unspecified biases, or to b) validate this supposedly-improved product against regional and national observations. Authors chose Mackenzie basin because of number, quality and duration of observations? So, show us the bias-corrected product against real-world observations in that specific region. Also for agricultural regions of southern Canada? Canadian shield where Quebec hydro presumably has good long-term records? This manuscript joins others in mountain hydrology and western Canada cold regions hydrology special issues. Several of those data sets come from Canada, with sufficient temporal and spatial extent to serve as validation tests. Quite strange to find this product in those special issues with no apparent recognition of validation needs or possibilities, especially after the authors have made abundant mention of observational challenges in mountain regions. So, show us valid improvements using these quality-controlled well-described data sets mountainous regions.

We also get nothing on uncertainties. GEM comes with an error matrix. CaPA presumably reduces some of the precip errors of the forecast but adds its own errors from gauge observations and radar, particularly for snow and blowing snow. ERA-Interim likewise contains a host of well-known and well-documented uncertainties. Combining those three products, including changes in spatial resolution, time step and vertical extent (2m vs 40m) will have amplified the source uncertainties and imposed additional error terms. But the products presented in Table 1 and Figures 3 and 4 appear perfect, never a plus/minus or error bar among them. Especially for wind and precip, that simply can't be true? These authors would not themselves use this product in hydrological models without error statistics. How can they expect readers to plan any subsequent analysis or application sans uncertainty information? The manuscript requires an extensive quantitative assessment and discussion of uncertainties.