Exploring bias adjustment methods of seasonal forecasts for applications in Northern Europe

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Seasonal forecasts can help stakeholders in preparing for adverse conditions and in strategic decision making in general. Such applications for different sectors (e.g., agriculture and winter tourism) are developed in the European ERA4CS project INDECIS by Finnish Meteorological Institute in cooperation with Finnish end-users. Forecasts of 2 m temperature, precipitation, wind, and soil moisture, available from ECMWF SEAS5 seasonal forecast system, will be corrected and evaluated up to 3 months lead time. The ERA5 reanalysis data is used as reference.

However, different weather parameters have different characteristics and require different methodologies for bias-correction, calibration and evaluation to be usable in the development of tailored products for stakeholders. For example, 2 m temperature is an essential parameter, much used and therefore extensive literature is available on the suitable methods for adjustment, while long-range forecasts of soil moisture have not been used widely, and the literature for bias adjustment is scarce. Moreover, as soil moisture can vary greatly on smaller scale, even the useful reference observations for the soil moisture are challenging. Technically, the statistical distributions of instantaneous wind and precipitation are very non-Gaussian, but monthly means can be rather Gaussian, that simplifies the adjustment somewhat. However, in seasonal forecasting, the amount of data available for fitting statistical models can be very limited. In bias adjustment, open source software packages, such as the R package Climate4R, are utilized as they enable rapid testing of different bias-correction methods (e.g., from simple delta method to more complex quantile mapping methods).

The results and potential added value of bias correction to the selected variables will be presented. The bias-adjusted variables will be used in the development and production of seasonal climate indices tailored for agriculture and winter tourism.