Daily calibration of seasonal forecasts to derive impact-relevant climate indices

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Climate information indices (CIIs) are impact-relevant quantities derived from basic meteorological variables such as rainfall or temperature. The computation of CIIs often involves absolute thresholds such as for the number of frost days per seasons or seasonal degree days. The dependence on absolute thresholds poses challenges in a forecasting context where such indices have to be derived from daily time series of forecasting systems with sometimes considerable systematic, time and location dependent biases. In order to reduce the effect of such biases on the skill of CII forecasts, the daily time series need to be calibrated before computing the CIIs.

Here we analyze the performance and the effect of several bias correction and calibration methods on the skill of seasonal CII forecasts derived from the calibrated daily series. We use seasonal forecasts from the European Centre of Medium-Range Weather Forecasts' (ECMWF) System 4 for the period 1981-2012, with a focus on the winter season. The forecasts are verified against CIIs derived from the ERA-INTERIM reanalysis. We find that bias correction and calibration approaches have a positive effect on the skill of CII forecasts. For CIIs involving a moderate non-linearity (e.g. seasonal heating degree days), all correction and calibration methods result in similar skill. For CIIs with pronounced threshold dependency (e.g. seasonal frost days), skill is more sensitive to the choice of calibration method. However, the analyzed daily correction and calibration methods do not achieve to produce reliable forecasts of seasonally aggregated CIIs. Hence, an additional re-calibration of the CII forecasts is necessary to get well calibrated CII forecasts.