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High resolution meteorological seasonal prediction over southeastern Romania

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High resolution seasonal predictions are very useful in various impact studies such as seasonal forecast of water requirements used in crop irrigation. Such information services could be directed towards better planning of water allocation and more efficient water use. Seasonal climate forecasts in Europe are currently issued at the European Centre for Medium-Range Weather Forecasts (ECMWF) in the form of multi-model ensemble predictions available within the "EUROSIP" system. Different statistical techniques to downscale the EUROSIP direct model outputs are used to optimize the quality of the final probabilistic forecasts. In this study, a statistical downscaling model (SDM) based on canonical correlation analysis (CCA) is used to downscale the ECMWF model (ensemble over the firs 15 members) forecast at a spatial resolution of 1km x 1km over south-eastern Romania covering five farms. The model has been developed in MOS mode, to carry out the seasonal prediction (on monthly scale) for AMJ (April-June), MJJ (May-July) and JJA (June-July) starting from March, April and May respectively; the model has been developed for each lead time (1 month-3 months) using as predictors the ECMWF hindcats over the period 1991-2016 for T850-air temperature at 850 hPa, H500-geopotential height at 500 hPa, SLP-sea level pressure and SH700-specific humidity at 700 hPa. The prectands are maximum/minimumtemperature (Tmax, Tmin) and precipitation (PP). The performance of the ECMWF model regarding the monthly values of the four large scale predictors as well as the performance of the prediction carried out directly by the ECMWF model for the same predictands is also analysed. 9 such CCA SDMs have been developed (3 lead times x 3 seasons) and the optimum model for each case has been established so that the model skill is maximum. The seasonal prediction for 2017 regarding the AMJ, MJJ and JJA seasons starting from March, April and May, respectively, have been carried out using the CCA SDM and the results have been compared to those obtained directly from the ECMWF seasonal predictions.
The results show that the combination between the T850, SH700 and SLP large-scale predictors has been found as the optimum onr for all the CCA SDMs. The highest performance is obtained for the JJA prediction starting from May and the lowest one for the AMJ starting from March. The Tmax and Tmin show the highest skill, especially in terms of sign of anomalies, while the PP exhibits the lowest one. These results are in agreement with the ECMWF performance in prediction of large-scale predictors as well as predictands. The test of independent seasonal prediction in 2017 (with the CCA model calibrated over 1991-2016) shows that the CCA SDM is more performant that ECMWF in prediction of the Tmax/Tmin anomaly sign. However, cases when the Tmax/Tminn show an opposite sign of anomalies seem to be not well predicted by the CCA SDM but a little bit better by the ECMWF model.
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