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Probabilistic forecast of major arable crops in Serbia and Austria

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Probabilistic forecast of crop production is based on the ensemble of crop model output estimates (CMO) which can be created either by using a larger number of crop models (by tuning of the crop parameters in one crop model) or by using created ensemble weather forecast data as input for crop model. In this study data from two locations, one in Serbia and one in Austria were used for the run of crop model with meteorological ensemble data as input files. Meteorological data in the form of seasonal forecasts was collected yearly during 2006-2014 period and were assimilated from the European Centre for Medium-range Weather Forecast (ECMWF) and the Meteorological Archival and Retrieval System (MARS). The number of ensemble members depends on the seasonal forecast system used in specific year. Probabilistic forecast of winter crops was done with crop model SIRIUS, while for the modeling of the spring crops AquaCrop was used. Crops that were chosen for the analysis are winter wheat, maize, spring barley and sunflower. Seasonal ensembles of crop model output estimates together with green water footprint estimates are analyzed in respect to their deviation from the values generated with observed meteorological data.
In an ideal case the observed value of crop model should be equal to average of ensemble estimates. Of course, due to the crop model and the weather forecast imperfection obtained results deviate from the observed values. Here we considered the models of probability distributions of the ensembles in order to get the estimate for the observed values of the variables. We test the normality of the probability distribution of ensembles with Sharpiro-Wilk test. For the inter comparison of the normally distributed CMO we used Z score to be able to compare multiannual ensemble estimates of crop model outputs for selected crops and locations. We also calculate ignorance of each CMO in order to compare how successful is our model in predicting various CMOs for various years. Since not all ensembles of CMO estimates are normally distributed we have performed analysis of the probability distribution which is the most adequate for their representation. These models of probability distributions of the ensembles of the CMOs can be later used as an insight into the future expected values and look of the data distribution without previous knowledge of observations.