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Analysis of monthly precipitations from a regional ensemble prediction system applied to irrigation management

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In the framework of a project named PREGI (an Italian acronym that means “hydro-meteorological forecast for irrigation management”) for the developing of a real-time drought forecasting, the REPS-WRF (Regional Ensemble Prediction System – Weather Research and Forecasting) model was coupled with an hydrological ensemble model of water balance to forecast the soil water content in a test area of Northern Italy. The WRF-ARW model has been used for each ensemble member and the initial perturbations were produced by a special application based on the Ensemble Transform Kalman filter, which was able to allow covariance localization whilst maintaining computational efficiency and removing spurious long-range correlation. Different convective schemes were also used at the same time in the WRF model for each simulation. The horizontal resolution at the regional scale was 18 km, with 42 vertical levels and 20 ensemble members. The forecast horizon was of one month. Since at longer integrations models tend to show some drift and systematic errors, to identify these errors and evaluate model ability to capture the monthly variability, a model climatology was built based on three years of runs. This climatology was also used to identify the anomaly from the unbiased monthly forecasts and, due to the application in the PREGI project, a special focus was made on precipitation, with the needs to identify specific thresholds to classify any rain event. Ensemble simulations were compared to the observations based on measures derived from weather stations, satellite data and radars. The results showed that precipitations are over-estimated in the alpine area and, generally, in the mountains, while in the Po Valley model’s estimation is much closer to the observed values. In terms of soil moisture, a mean relative error of less than 10% was achieved in forecasts up to 14 days.