Prediction of moisture availability in agricultural soils using probabilistic monthly forecasts

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Despite technological advances in breeding and agricultural practice, crop yield remains subject to considerable inter-annual variability related to short-term (seasonal) climate fluctuations. Of utmost importance in this context are variations in soil water availability. Extreme conditions such as the heat wave observed in Europe during the summer of 2003 can lead to anomalous soil moisture depletion and induce considerable losses in crop production. The prediction of soil water levels using monthly forecasts could provide valuable means for risk assessment and mitigation.

We present first results of a prediction system for soil moisture forecasts with a lead time of up to one month. The system uses dynamical, probabilistic forecasts of daily temperature, precipitation and global radiation from the European Centre for Medium-Range Weather Forecasts. The forecasts drive a bucket model of the water balance in the root zone. The skill of the system is assessed using a series of hindcast experiments. We show that the seasonal evolution of the soil water available to crops is well reproduced by the system and we discuss possible implications for farm operations.