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Global distribution of irrigated agricultural area: A spatio-temporal modelling approach.

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One of the biggest challenge in the coming decades will be to ensure the food supply of an increasing world population. Therefore irrigation will play an important role in food production. Today ∼80% of cropland are managed as rainfed and ∼20% as irrigated (FAO). However many studies have identified irrigated cropland as a major user of global freshwater resources, and it is expected that the share of irrigated land will rise by 20% till 2030. Thats why the competition over scarce water resources will intensify within the next decades, especially in arid and semi-arid regions.
In this study we aim to address the share and location of irrigated area in agricultural production and irrigation water requirements. In order to analyze these effects, a spatially explicit land-use model (LandSHIFT) is soft-coupled with a water-use model (WaterGAP3). LandSHIFT uses socio-economic factors to calculate alterations in location and extent of land-use activities such as crop cultivation and livestock grazing at 5 arc minutes resolution. WaterGAP simulates the impact on water availability and irrigation water use. Moreover, the improved model is also capable of simulating spatio-temporal dynamics of irrigated area.
Here we show how allocation of irrigated area is handled in the model and present global scenario simulation results. Furthermore a comparison to scenarios without irrigation is introduced. As a result, we can show the high relevance of irrigated cropland for agriculture modeling. In addition the possibilities and limitations of interchanging information between land-use and hydrological models are demonstrated. The study finally underlines how important interdisciplinary work is for improving scenario simulations.