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Integrating new aspects of irrigation water-use into an interdisciplinary global land-use modelling framework

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Agriculture constitutes an essential link between atmosphere, biosphere and anthroposphere, and appears as both driver and target of global changes. Projected trends of population growth and climate change may add further pressure on resources like land, water and energy.

Global approaches in land-use modelling tend to focus on economic or geographic aspects. Integrated models in turn are very comprehensive and often apply empirical rule-based methods, thus neglecting economic motivation and dynamic market feedbacks. Irrigation cost and water scarcity are mostly considered rather as a consequence of land-use decisions than as decisive factors.

To address aspects of both economically and ecologically sustainable land-use options, an integrated coupling tool is developed to analyze effects of changing water availability and irrigation cost on global crop distribution, incl. the consideration of energy use and environmental risks. Crop allocation is based on profit maximization.

The model is designed as an interface to couple global economy and environmental models. Further integration of water demands, different irrigation methods, and related cost improves the interdisciplinary approach to enable integrated assessment of land-use issues. By the application of geographic and technological constraints a sustainable utilization of water and energy resources is projected to reveal alternative pathways of future crop allocation and irrigation management. Furthermore feedbacks between policies and economy, as well as their impacts on water balances may be in-

vestigated against the background of global change and food security.