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AgriAdapt – Agricultural adaptation to climate change and its impacts on groundwater resources

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Climate change will profoundly alter production conditions for agriculture in Switzerland, thus making the need for adaptation unavoidable. At least in some regions of Switzerland, drought limitations are expected to increase. Possibilities to adapt to these intensified pressures can be to change crop mixtures and/or to install or increase irrigation. However, adaptation with a singular focus on agricultural production bears the risk of maladaptation. The aim of this project is therefore to evaluate the risks of maladaptation in Swiss arable agriculture associated with feedbacks to the hydrogeological system.
Our specific research questions are as follows:

• What is the impact of climate change on future water demand for irrigation and on groundwater resources?
• What are the combined impacts of climate change and irrigation on groundwater resources? How large is the risk of maladaptation through intensive irrigation?
• Which alternative adaptation strategies could reduce the risk of maladaptation on the long term (e.g. changes in crop mixtures, changes in cultivation zones)?

To answer these questions in a quantitative manner, a coupled model approach is developed to investigate the close interactions and feedbacks between climate, agriculture, hydrology, and hydrogeology. In more specific, the hydrogeological model FeFlow, is constraint for the recent and future climate change conditions by the hydrological model WaSiM-ETH (providing hydraulic heads of river and lakes), and by the cropmodel CropSyst (providing groundwater recharge by rainfall taking into account irrigation demand of each crop type).
The coupled model system is applied in a case study region "Seeland", the most productive and nationally important agricultural area in Switzerland. Possible adaptation pathways are developed and evaluated for their adaptation suitability under current and future climate change conditions (2020-2099) for different emission scenario. We make use of the forthcoming CH2018 transient climate scenarios. Here, we present the set up and preliminary results of the project.