Geophysical Research Abstracts
Vol. 18, EGU2016-13450, 2016
EGU General Assembly 2016

Impact of climate change on the water cycle of agricultural landscapes in Southwest Germany

Irene Witte, Joachim Ingwersen, Sebastian Gayler, and Thilo Streck
Germany (irene.witte@uni-hohenheim.de)

For agricultural production and life in general, water is a necessity. To ensure food and drinking water security in the future an understanding of the impact of climate change on the water cycle is indispensable. The objective of this PhD research is to assess how higher temperatures, higher atmospheric CO_2 concentration and changing precipitation patterns will alter the water cycle of agricultural landscapes in Southwest Germany. As representative key characteristics data evaluation will focus on water use efficiency (WUE) and groundwater recharge.
The main research question is whether the positive effect of elevated atmospheric CO_2 on WUE will be overcompensated by a decrease in net primary production due to warming and to altered seasonal water availability caused by higher rainfall variability. Elevated atmospheric CO_2 stimulates plant growth and improves WUE, whereas higher temperatures are expected to reduce net primary production and groundwater recharge.
Another research question referring to groundwater recharge is whether groundwater recharge will increase in winter and decrease in summer in Southwest Germany. Changed groundwater recharge directly affects drinking water supply and is an indicator for possible temporary water shortages in agricultural production.
A multi-model ensemble composed of 16 combinations of four crop growth models, two water regime models and two nitrogen models will be calibrated and validated against sets of field data. Field data will be provided by FOR 1965 from 2009-2015 for the Kraichgau region and the Swabian Alb, two contrasting areas with regard to climate and agricultural intensity. By using a multi model ensemble uncertainties in predictions due to different model structures (epistemic uncertainty) can be quantified. The uncertainty related to the randomness of inputs and parameters, the so-called aleatory uncertainty, will be additionally assessed for each of the 16 models. Hence, a more reliable range of future scenarios can be derived and supports to develop practicable mitigation strategies.