Geophysical Research Abstracts
Vol. 12, EGU2010-6864, 2010
EGU General Assembly 2010

Integrated validation of modeled plant growth, nitrogen- and water-fluxes in the agricultural used Rur catchment in Western Germany

Wolfgang Korres, Christian Klar, Tim Reichenau, Peter Fiener, and Karl Schneider
University of Cologne, Department of Geography, Chair of Hydrogeography and Climatology, Cologne, Germany
(wolfgang.korres@uni-koeln.de/Fax-Nr.: +492214705124)

Numerous studies have shown that agricultural management is one of the key drivers for spatio-temporal patterns of soil moisture in agricultural landscapes. The process-based ecohydrological model components of the integrated decision support system DANUBIA are used to identify the important processes and feedbacks determining soil-moisture patterns in agroecosystems. Interactions between plant growth, soil hydrology and soil nitrogen transformation processes are modeled by using a dynamically coupled modeling approach. Integrative validation of all three model components serves as a basis for modeling analysis of spatial soil moisture patterns.

DANUBIA is parameterized and validated for the Rur catchment located in Western Germany. For integrative validation, an extensive three year dataset (2007 – 2009) of soil moisture- (TDR, FDR), plant- (LAI, organ specific biomass and N) and soil- (texture, N, C) measurements was acquired. Plant measurements on an arable land test site were carried out biweekly. Measurements were conducted for winter wheat, maize and sugar beet during the growing season. Soil nitrogen and carbon measurements were taken before, during and after the growing season. Field averages of plant and soil parameters are derived from three individual measuring locations within each test field. Soil moisture was measured with three FDR soil moisture stations in 10 and 30 cm depth. In a grassland test site biomass measurements were carried out biweekly in 2009. Soil moisture was monitored at different locations in up to 60 cm soil depth using FDR- and TDR-stations. Meteorological data was measured with an eddy flux (arable land) and energy flux station (grassland test site).

First results of point validation are in very good agreement with field measurements. Model results for winter wheat in 2007/2008 match field measurements well for both, the overall biomass (R^2= 0.97, rel. RMSE = 16.8%, Nash Sutcliff – model efficiency ME = 0.96) as well as for individual plant organs (e.g., storage organ: ME = 0.99, living leaf: ME = 0.79). Modeled LAI provide a R^2= 0.87 and a ME value of 0.77. Surface soil moisture in the upper layer showed an $R^2$of 0.73, an absolute RMSE of 3.8 Vol.-% and a ME value of 0.12. However, the agreement of model results with soil moisture measurements decreases with increasing soil depth.

Our ongoing research aims at analyzing spatial patterns of soil moisture and vegetation parameters for the Rur catchment and particularly upon utilizing soil moisture maps retrieved by radar remote sensing for this purpose.