SWIM: SOIL AND WATER INTEGRATED MODEL

SWIM

SWIM is an ecohydrological integrated river basin model simulating runoff generation, nutrient and carbon cycling, plant growth and crop yield, river discharge and erosion as interrelated processes at a daily time step using regionally available data and considering feedbacks. It was developed to investigate climate and land use change impacts at the regional scale. The model set-up and postprocessing are supported by a GIS interface.

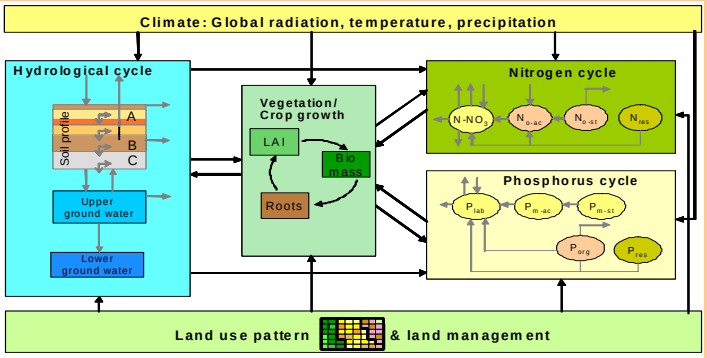

Figure 1: The overview of processes included in SWIM

EXAMPLES OF APPLICATIONS:

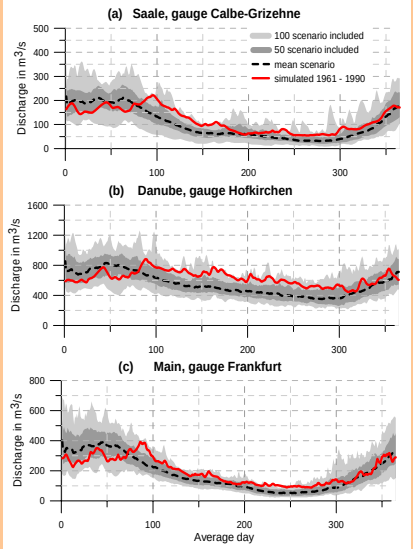

Figure 2: Climate impact study for Germany: seasonal dynamics of river discharge in the scenario period (2051-2060) and the reference period (1961-1990) for three selected rivers.

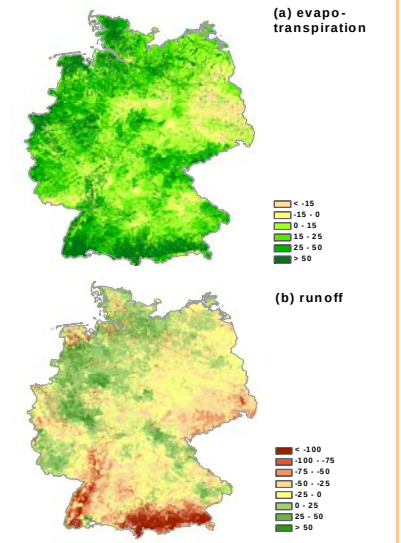

Figure 3: Climate impact study for Germany: changes in evapotranspiration and runoff between the scenario period (2051-2060) and the reference period (1961-1990).

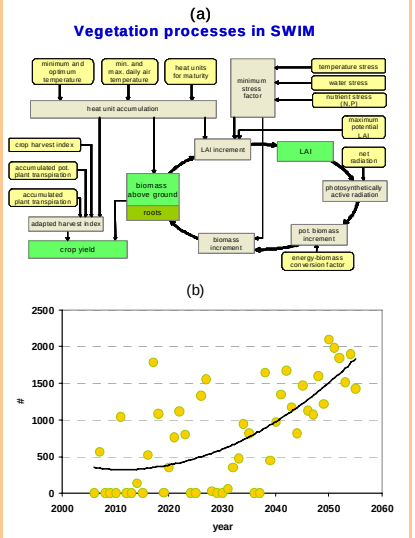

Figure 4: The vegetation module in SWIM (a), and the model results for crop phenology showing the increase of number of HRU in Germany with a second crop per year under scenario conditions (b).

DIRECTIONS OF MODEL DEVELOPMENT:

- SWIM is being coupled to the dynamical regional model CCLM to better reproduce hydrological cycle in RCM including feedbacks of the landscape pattern to climate processes (resp.: J. Volkholz & F. Hattermann);
- the SWIM-CN version, which includes full carbon cycle, is being updated. (resp.: J. Post & C. Rachimov)
- riparian zone processes at the river basin scale (additional water and nutrient uptake) are included in a new version of SWIM (resp.: T. Vetter & F. Hattermann);
- snow module is being adjusted taking into account elevation zones and interpolating temperature at the hydrotope level (resp.: Sh. Huang);
- in-stream processes (biota and nutrient cycling) are being integrated in order to enable better representation of the landscape - river interactions (resp.: C. Hesse);
- the "Elbe-Expert-Toolbox"-version of SWIM is interactively coupled with the water management model WBalMo of DHI-WASY by the OpenMI framework (resp.: T. Conradt & C. Rachimow).

List of selected papers:

Hattermann, F.F., J. Post, V. Krysanova, T. Conradt and F. Wechsung 2008. Assessment of Water Availability in a Central-European River Basin (Elbe) Under Climate Change. Advances in Climate Change Research 4, 42-50.

Hesse, C., V. Krysanova, J. Päzolt, F. Hattermann., 2008. Eco-hydrological modelling in a highly regulated catchment to find measures for improving water quality. Ecological Modelling, 218, 135-148.

Huang, Sh., C. Hesse, V. Krysanova and F. Hattermann, 2008. From meso- to macroscale dynamic water quality modelling for the assessment of land use change scenarios. Submitted to Ecological Modelling

Yu, P., V. Krysanova, Y. Wang, W. Xiong, F. Mo, Zh. Shi, H. Liu, T. Vetter & Sh. Huang, 2009. Quantitative estimate of water yield reduction caused by forestation in a water-limited area in northwest China, Geophysical Research Letters, 36, L02406, doi:10.1029/2008GL036744.

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RESEARCH DOMAIN II - CLIMATE IMPACTS AND VULNERABILITIES
REGIONAL IMPACTS AND STRATEGIES
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SHAOCHUN HUANG, CORNELIA HESSE, TOBIAS CONRADT AND TOBIAS VETTER

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