Geophysical Research Abstracts
Vol. 13, EGU2011-11803, 2011
EGU General Assembly 2011

Modeling the structural heterogeneity of an artificial hydrological catchment.

Thomas Maurer (1), Anna Schneider (1), Uwe Buczko (2), and Horst H. Gerke (3)

(1) Brandenburg University of Technology, Research Center for Landscape Development and Mining Landscapes, Cottbus, Germany (maurer@tu-cottbus.de, +49 (0)355 695090), (2) Faculty for Agronomical and Environmental Sciences, University of Rostock, Rostock, Germany, uwe.buczko@uni-rostock.de, (3) Institute of Soil Landscape Research, Leibniz-Centre for Agricultural Landscape Research (ZALF), Muencheberg, Germany, hgerke@zalf.de

Modeling spatial heterogeneity in catchments is a precondition for the understanding of flow processes, the implementation of hydrologic models, and moreover for the assessment of certain parts of ecosystem behaviour. Establishing a geologically realistic spatial catchment model requires knowledge of the specific catchment architecture and its formation processes. Current geostatistical methods are unable to capture complex spatial conditions, e.g. abrupt changes across structural units.

We present a process-based structure generator approach that reproduces the substrate heterogeneity of the artificially created catchment “Chicken Creek” in Lower Lusatia, Germany. In this specific case, substrate distribution strongly was governed by the technological processes associated with the applied large-scale machinery, but also on the geological constellation of the source material at the excavation site. The adequate reproduction of observed heterogeneity is based on a considerable amount of input data concerning especially catchment boundary geometries and substrate properties.

The fundamental structural elements in the model are 2D-cross sections of overburden spoil cones. The structure generator creates individual cross-section geometry, particle distributions and bulk densities and considers processes of particle segregation as well as compaction in the center of spoil cones. Sequencing along the known stacker tracks produces a realistic 3D-constellation of structural elements. The structure generator data was interpolated in a gridded 3D-volume body using functionality of the GOCAD software. Due to the potentially very high spatial resolutions that can be realized with the current approach, the establishment of spatial models at multiple scale levels is possible.

A variety of model realizations of structural heterogeneity were evaluated with respect to uncertainties and the concordance with hard conditioning data from field surveys.