Geophysical Research Abstracts
Vol. 14, EGU2012-4099, 2012
EGU General Assembly 2012

Fuzzy delineation of drainage basins through probabilistic interpretation of diverging flow networks

W. Schwanghart (1) and T. Heckmann (2)

(1) University of Basel, Department of Environmental Sciences, Basel, Switzerland (w.schwanghart@unibas.ch), (2) Catholic University of Eichstaett-Ingolstadt, Department of Physical Geography, Eichstaett, Germany

The assessment of uncertainty is a major challenge in geomorphometry. Methods to quantify uncertainty in digital elevation models (DEM) are needed to assess and report derivatives such as drainage basins. While Monte-Carlo (MC) techniques have been developed and employed to assess the variability of second-order derivatives of DEMs, their application requires explicit error modelling and numerous simulations to reliably calculate error bounds. Here, we develop a network model to quantify and visualize uncertainty in drainage basin delineation in DEMs. The model is based on the assumption that multiple flow directions (MFD) represent a discrete probability distribution of non-diverging flow networks. The Shannon Index quantifies the uncertainty of each cell to drain into a specific drainage basin outlet. In addition, error bounds for drainage areas can be derived. An application of the model shows that it identifies areas in a DEM where drainage basin delineation is highly uncertain owing to flow dispersion on convex landforms such as alluvial fans. The model allows for a quantitative assessment of the magnitudes of expected drainage area variability and delivers constraints for observed volatile hydrological behavior in a palaeoenvironmental record of lake level change. Since the model cannot account for all uncertainties in drainage basin delineation we conclude that a joint application with MC techniques is promising for an efficient and comprehensive error assessment in the future.