Geophysical Research Abstracts,
Vol. 11, EGU2009-9303, 2009
EGU General Assembly 2009

Modelling channel incision and drainage basin evolution with a multi-scale simulation model

N.S. Anders, A.C. Seijmonsbergen, and W. Bouten

Universiteit van Amsterdam, Institute for Biodiversity and Ecosystem Dynamics, Computational Geo-Ecology, Amsterdam, Netherlands (anders@uva.nl)

In this research we present a new and multi-scale approach to simulate channel incision and drainage basin evolution. A vector bedrock channel incision model (CIM) dynamically simulates the development of a longitudinal river profile at a fine scale. The CIM is combined with a grid cell-based reaction-diffusion erosion model to incorporate hillslope development at a broad scale, as a response to an incising fluvial network of bedrock river channels. The combined simulation model is applied to the post-glacial landscape evolution of a geologically complex Alpine catchment. High resolution laser altimetry data is used to reconstruct the catchment's late-glacial topography that served as initial model conditions for a simulation towards the present. Longitudinal and cross sectional profiles extracted from model output and the current elevation data are compared to evaluate the model performance. The combined model is time-efficient and is able to realistically adapt to contrasting geological substrata, including knick-point recession and a variable hillslope development. Dynamic geomorphological simulation models, in combination with high resolution datasets, facilitate research of complex and difficult-to-access mountainous terrain at greater detail than before. It potentially paves the way for more efficient landscape evolution research and can contribute to increasing the understanding of the functioning of geo-ecological systems.