Geophysical Research Abstracts
Vol. 20, EGU2018-3301, 2018
EGU General Assembly 2018

Impact erosion, alluvial cover, and the width and slope of bedrock channels

Jens Turowski
GFZ German Research Centre for Geosciences, 5.1 Geomorphology, Potsdam, Germany (turowski@gfz-potsdam.de)

Bedrock channel slope and width are important parameters for setting bedload transport capacity and in stream-profile inversion to obtain tectonics information. However, we are lacking a widely accepted theory for bedrock channel width. As a results, width is typically calculated by assuming empirical scaling relations. Here, a 1D reach-scale model of bedrock channel morphology is constructed based on process physics. The main assumptions of the model are that lateral erosion occurs when bedload particles are sideward deflected to impact the walls, and that the rate of change of channel width over time is dependent on bed cover only. Based on the physics of erosion by bedload impacts, a scaling argument is developed to link bedrock channel width and slope to bed cover and to sediment supply, discharge and erodibility. The simple model built on sediment-flux driven bedrock erosion yields the observed scaling relationships of channel width and slope with discharge and erosion rate. The model is physically complete in the sense that it does not feature a lumped calibration parameter. All model parameters have a straight-forward physical interpretation and can, at least in principle, be measured in the laboratory or the field.