



Boulder distribution in a headwater catchment

Antonius Golly (1), Jens Turowski (1,2), Alexandre Badoux (2), and Niels Hovius (1)

(1) Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, Telegrafenberg, 14473 Potsdam, Germany, (2) WSL Swiss Federal Institute for Forest, Snow and Landscape Research, 8903 Birmensdorf, Switzerland

Headwater catchments are usually transport limited fluvial systems meaning that large amounts of sediments are stored in the channel over long time periods until transport capacity rises during flood events. Available sediment fractions include small, frequently mobile grains and large, rarely mobile clasts or boulders that have a number of functions in the fluvial system. Often, large clasts build channel-spanning forms, bear most of the shear stress and contribute to the channel's resistance and stability. Boulders often induce steps (key-stone hypothesis) where grain diameters determine the step height. Although the effects of single boulders are well studied in various lab and field experiments, extensive analysis of boulder distributions along channel reaches are rare due to the lack of observational data.

Here, we analyze a large dataset of boulders in the Erlenbach, Switzerland, a mountain stream with a mean slope of 17%. Data on size, orientation and location have been collected for more than 350 boulders with a grain diameter greater 50cm (b-axis) along a 550m channel reach. In addition, channel geometry – long-profile and channel width – has been surveyed precisely with a total station. From the long-profile steps are identified with an automated algorithm.

We find that the spatial distribution of the boulders along the study reach is not uniform but follows a clustered pattern. We compare the location of the boulders to various channel measures (local slope, average gradient, channel width) to find valuable proxies. Furthermore, we determine the appearance of the boulders with respect to the identified steps.