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Supplement of

Autogenic knickpoints in laboratory landscape experiments

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SUPPLEMENTARY METHODS

The experiments were conduct at the Géosciences Environnement Toulouse (GET) laboratory using a setup specifically designed for studying landscapes and erosion dynamics at the drainage basin scale (Fig. S1). The facility is a box with horizontal dimensions of 100 x 55 cm and 50 cm deep. At its front side, a 41 cm wide sliding gate drops down at constant rate, acting as the base-level for erosion. The box is filled with silica grains (D_{50} ~20 µm) that are mixed with water and homogenized to saturate the silica paste porosity, reducing infiltration and allowing surface runoff. During an experimental run the sliding gate drops down at a constant rate and artificial rainfall is applied using 4 industrial sprinklers that generated small water droplets (Ø < 50 µm) to avoid splash effect at the surface of the model. Precipitation was preliminary calibrated by collecting droplets in 50 pans regularly disposed at the model location. The mean spatial precipitation rate of each experiment is of 95 $mm.h^{-1}$ with a spatial coefficient of variation (Standard deviation/mean) of 35%. Base level fall and precipitation rates are computer-controlled and remain constant during an experiment. During a run, the experiment is stopped every 5 minutes in order to digitize its topography using a laser-sheet device and to produce DEMs with a spatial resolution of 1 mm from point cloud data.

We report here results from 3 experiments, BL15, BL10 and BL05, performed with different rate of base-level fall, of respectively 15, 10 and 5 $mm.h^{-1}$ and their duration time exceed 1000 minutes of erosion (Table 1).

Figure S1. *Overviews of the experimental setup.*

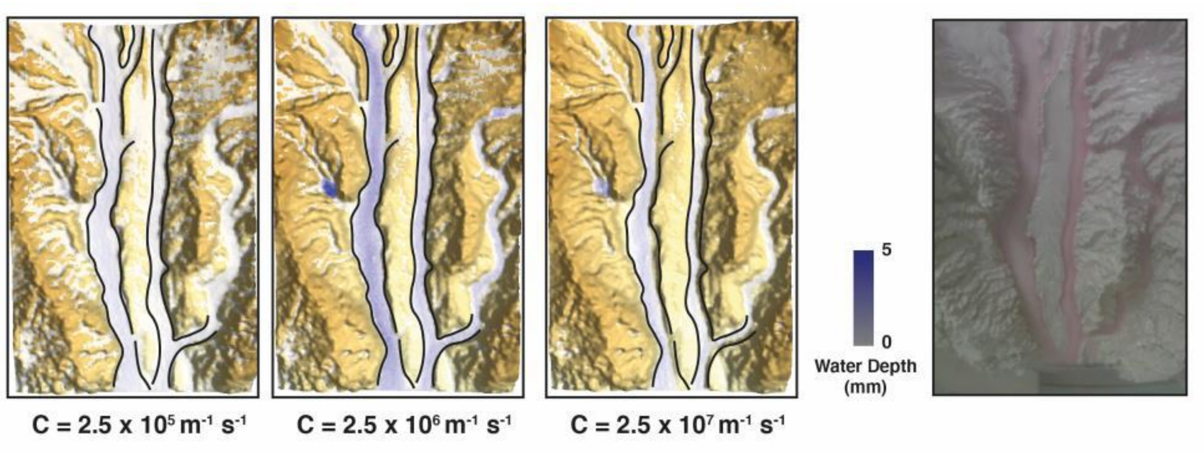

Figure S2. *Floodos hydrodynamic model water depth output for three different friction coefficients C applied on the same DEM of an experiment. Black lines indicate the actual channel boundaries observed during the corresponding experimental run by injected red dye in the water used to produce the artificial rainfall (right). Channels visible on water depth maps tend to have a good match with actual observed channels when using the theoretical value of the fiction coefficient (2.5 x* 10^6 *m*$^{-1}$ *s*$^{-1}$*).*

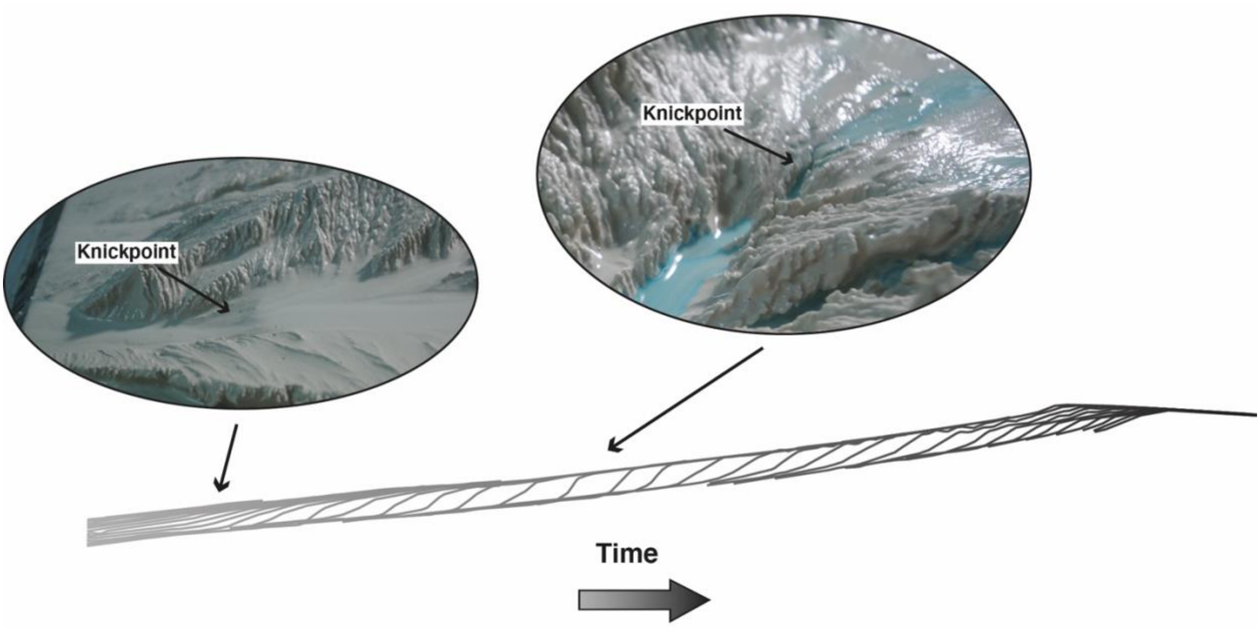

Figure S3. *Extraction of rivers longitudinal profiles (bottom), showing the propagation of an individual knickpoint (the one highlighted in Figure 7, from the experiment BL10). The two photos illustrate the evolution of the knickpoint shape through time (grey gradient) and according to its position along the distance from the outlet.*

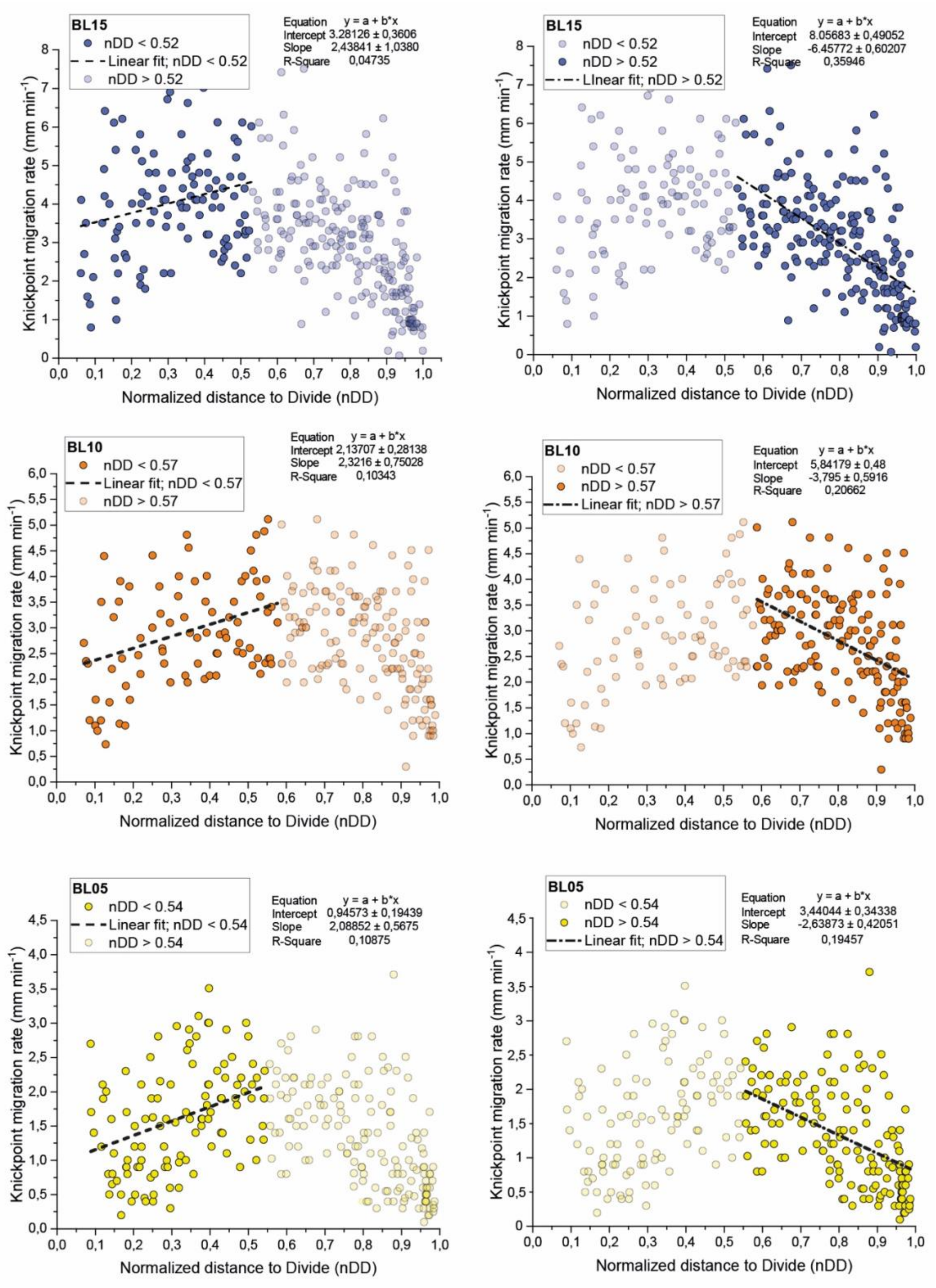

Figure S4. *Linear fits on knickpoint migration rates vs normalized distance nDD data considering separately data for nDD < nDDVmax (left) and nDD > nDDVmax (right). Despite large scattering, the slope of the fits is positive in the first case but negative in the second one which supports the finding that knickpoint retreat shows a trend of increasing and then decreasing velocity as knickpoints retreat upstream and the use of a second order polynomial fit for describing these data (see text and Fig. 9C).*

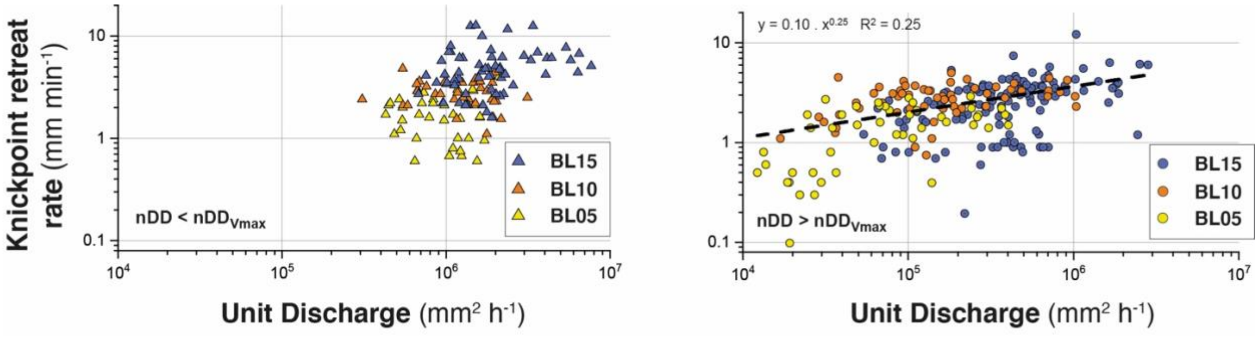

Figure S5. *Relationship between knickpoints retreat rates and unit discharge (total discharge normalized to river width) for* $nDD < nDD_{Vmax}$ *(left) and* $nDD > nDD_{Vmax}$ *(right). Data for knickpoints above* nDD_{Vmax} *allows to consider retreat rates against more than two orders of magnitude of unit discharge and are consistent with an increasing rate of retreat with discharge. Data below* nDD_{Vmax} *show 3 distinct fields without any clear trend with discharge. The restricted range of discharge data however limits the analysis.*