Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2019-48-RC1, 2019

Earth Surface Dynamics Discussions

Interactive comment on "Lithology and orographic precipitation control river incision in the tropical Andes" *by* Benjamin Campforts et al.

Anonymous Referee #1

Received and published: 17 November 2019

General comments

Dear Authors, Overall I found the manuscript scientifically interesting, well written and structured. The topic is of interested for the geomorphological community, however its acceptance could be strengthened after minor corrections (see details below).

Scientific comments 1. I would suggest that the authors use a different misfit function for calculating the fit of the model to the data (see details in technical corrections). 2. It is not clear if the gained conclusions are applicable or transferable to other settings and therefore how much impact the manuscript will have in the community. The scientific relevance could be significantly strengthened if other available datasets are compared to the presented study (e.g. from DiBiase or Carritier in the the San Gabriel Mountains and the Andes). I hope you find my comments and suggestions helpful.

Technical corrections: Line 16-27: Since there is not word limit on the Abstract you should give some more details here. For instance, what are the erosion rates and how they differ in different lithologies/rainfall? Would be nice to have some absolute or relative values on erosion/incision depending on lithology/rainfall. Line 38: I would not give a fixed minimum catchment area since this is site-to-site depending, e.g. Kober et al. (2012) or West et al. (2014) found that nuclide concentrations of larger catchments are perturbed by single mass-wasting events. Line 42: Change to '. . . have been found to correlate with a . . .'. Line 55: Delete 'external'. Line 58-62: Please rewrite/reorder this sentence. Line 144: I would suggest to use a different misfit function, since the result is depending on the distribution of measured erosion rates and does not take into account the analytical uncertainties. Use a simple misfit function such as: Misfit=$\sum\_(I = 1...nb)\sqrt{}$(((O_i-M_i)/E_i)ˆ2) A misfit of nb or smaller would indicate that you predict the observations within the e.g. 1 standard deviations of all observations (if E is the standard devation) and a value of 2*nb would mean you are within 2 standard deviations . . . Equation (10): Not sure, but have you explained what Kst is? Equation (11): I guess it should be ksn and not ks. Line 182: Please refer to the corresponding equations (4). Line 184: Please make sure that all local names of locations, mountain ranges, basins. . .. are shown in a figure for those reader that are not familiar with the geological/geographic setting. Line 216: A recent paper (DiBiase et al. 2018) showed that TCN do not need to be corrected for topographic shielding because of deep non-vertical attenuation paths. Line 378: Would be nice to show that the fits to your data are statistically different for your different complex models. Visually they are look very similar and if I take the confidence intervals shown that overlap. Line 384: I would not use a chapter heading without text. Line 391: In addition to the supplementary figure please add the position of knickpoints in one of your maps. Line 393: Is the baselevel lowering or the uplift increasing, please clarify! Line 430: Why do you assume that hydrological/climate changes occurred more likely on Myr-timescale compared to timescales erosion rates are averaging over? Please explain this. Line 432: Add '. . .timespan of ECRN and ksn measurements.'

Table 1: Change to ‘Flow resistance. . .’ Figure 1: The faults and labelling of faults is difficult to see. Larger line width and fonts, maybe even colour would help. Please show the main streams as lines. Figure 5: Add coordinates.

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