

Earth Surf. Dynam. Discuss., referee comment RC2
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Comment on esurf-2021-48

Richard Ott (Referee)

Referee comment on "Rapid Holocene bedrock canyon incision of Beida River, North Qilian Shan, China" by Yiran Wang et al., Earth Surf. Dynam. Discuss.,
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This manuscript studies the river terraces of the Beida River in the northern Qilian Shan. The authors survey and date the terraces and use this information to reconstruct changes in incision rate through time. The authors then discuss the origin of a steeper segment within the channel profile and link it to an increase in precipitation during the mid-Holocene. I think the manuscript has potential, but a more thorough analysis would make this a much stronger contribution.

My pain point is that a more thorough morphometric analysis would benefit the manuscript. The authors argue for a precipitation increase which should be regional. Therefore, it would be good to have chi-plots of the Beida and neighboring rivers, including tributaries, for the lower river section where the knickzones are located. Are the knickzones migrating up the tributaries, too? Are they at the same chi-distance compared to the trunk rivers? If, e.g the knickpoints do not manage migrate up the tributaries as fast the trunk (in chi-space), this could be an indication that glacial melt is indeed the controlling factor, whereas an even increase in precipitation should affect all streams in the region in the same way.

I would appreciate more clarity in the way tectonic drivers controlling the profile geometry are ruled out. The first argument presented is that the current channel is carved in bedrock and not just an excavation of the old alluvial fill. I do not see the connection between this argument and incision due to a period of increased uplift. I would appreciate some clarity on this point. The second argument about incision rates being higher as uplift rates is good but it would be far more convincing if you present it in terms of total uplift since the abandonment of T1 versus total incision. This point would come across a lot better with more visual support within some figure. Also, there's no figure that visualizes where the folding happens. Figure 3 would also benefit from having the locations of faults (active and now inactive) on the map, similar to Wang et al. 2020.

This might be more of a side note, but judging from Wang et al. 2020, the knickzone is located just above a thrust fault that became recently inactive, correct? Maybe it should be pointed out that this fault has been inactive for a time exceeding the age of the terraces studied here.

Line 60: Please, highlight the Hexi Corridor in figure 1. I had to look up the name.

Line 89: Seems like either a word is missing or something else is wrong with the sentence.

Line 118: What grain size was the measurement performed on?

Line 180-2: The Loess was dated to 3.2kyrs, therefore this is a minimum age and not the age of the terrace, correct? And same would apply to the incision rates.

Line 192-3: This is weird. Why would the river cut through bedrock instead of the soft alluvium?

Line 234-243: This sounds good to me, but I feel like the whole paragraph could be a lot shorter if there was somewhere a geologic map of the Beida and the neighboring rivers, with the steep segments highlighted. Could also be in the supplement.

Figure 1: I have two points that are more of a suggestions. It would be good if the color map could be changed to something that is perceptually uniform (e.g. <https://www.fabiocramer.ch/colourmaps/>), and please add an underlying hillshade to improve visibility of the topography.

Figure 3: The label of Fig. 2C needs to be changed to 3C. I find it very confusing that the samples are indicated by alphabetical labels, because intuitively I would think that the letters indicate the locations of the picture panels. Please, use numbers or something else instead. Also, please highlight the geologic contacts. I cannot see the contact between alluvial fill and bedrock in figure 3D.

Richard Ott