



EGUsphere, referee comment RC1  
<https://doi.org/10.5194/egusphere-2022-1285-RC1>, 2023  
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## Comment on egusphere-2022-1285

Anonymous Referee #1

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Referee comment on "Building a bimodal landscape: bedrock lithology and bed thickness controls on the morphology of Last Chance Canyon, New Mexico, USA" by Sam Anderson et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1285-RC1>, 2023

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### 1. general comments

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Overall, this manuscript deals with and discusses a relevant and well-set study topic fitting the current state of research on landscape development based on lithological setting. There is a good and clear hypothesis, though, there are several issues to be faced in the current version of the paper:

- the introduction needs a distinct backing-up and reasoning by more literature; the discussion needs to be straightlined
- there is need of more discussion why the one outlier (L3.2) is valid as it is basic for some results/interpretations
- the outcomes developed in the discussion need to be more streamlined and several contradictions need to be cleared
- several figure panels should be combined to ease the interpretations

Thus, this study findings would generally be worth publishing after addressing the above mentioned tasks - below there are several detailed hints/notes/suggestions on how to address them - both scientifically and technically.

### 2. specific comments

#####

L1 use a more expressive statement

L23 abstract: we believe?

INTRO

L27 (only) little debate?

L35 also Shobe++2021, GSA Bulletin

L37 needs definition what the ksn actually is (physically) or general description of channel profile descriptors (as they are more defined in the methods)

L45 needs info on the geochemical methods and data as background, there is no info yet

L47-L49 why inverse (physical explanation)?

L54 also Scott&Wohl2019, ESPL

L56 cf. Bursztyn++2015, EPSL

L57 to fluvial geomorphologists, too!

L58 intro of sediment availability, sediment size, btools and cover, and discharge variability is missing, also channel width vs. steepness is not mentioned - these topics are fundamental in this context!

L59 reason, why first-order channels (also, what are these)

L61 too colloquial text - e.g., "find rock mineralogy" ...

L65 landscape or river channels?

L68ff higher elevation in this scenario!

L70 is this for a ~steady state case the weaker erodibility may be deducted even? (cf. Mitchell & Yanites 2021, ESURF)

#### FIELD

L71 climate (so  $K_c$ ) is assumably constant, i.e. can be ignored for this analysis?

L85 how about the sediment (size distribution, lithological partition) in the investigated reaches?

#### METHODS

L105 Xi needs references

L109f which DEM; why 75m?

L112 are the San Gabriel Mountains reasonably comparable to your site (concerning channel geometry, lithology, grain sizes, climate etc.)?

L117 a metric interval would be more tangible for the community

L118 why (only) the largest boulder - is this significant of anything (e.g., cover)? What is the relation to / meaning for smaller grain sizes?

L121 which unit

L133 define what plucking is, and why it is important here

L142 posting? you mean resolution?

fig4b end of caption is unclear; line colors in c and d are hard to differentiate - take a color-blind friendly range; indicate the Sitting Bull Falls in 4a (is this at L3.2?); also having notes on which channel holds which lithology (refer to fig.2) would be very helpful to get the point

fig5 how does a plot of discontinuity vs. Schmidt Hammer Rebound look like? What do the results tell you?

#### RESULTS

L187f the carbonate values are not much different between steep and shallower sections

L201 how does the pattern look like if you clip the actual in-channel boulders from the 500m window

L208ff I assume you refer to fig.7 - you state there "all boulders", but these are 'only' the largest boulders per reach, right? So, at least your result is not generally valid?

#### DISCUSSION

L221ff for the 5 points refer back to the figures, respectively!

L226 Shobe++2016, GRL

L229 didn't you measure larger Schmidt hammer values in the shallower sections above attesting them harder rock?

L231 that may be valid for your lithologies, but not generally

L236 I don't get this reasoning ...

L238 you mean there only is one data point for steep slopes that determines your whole interpretation above - correct; you say here you ignore it - so what about all the results?; why is this outlier there (is it a transient knickpoint? this would contradict L227ff)

L244ff several repetitions, reduce

L252 so why are there steep vs. shallow carbonate sections

L261 so erosion is focusing on the steep sections (until they are shallow enough to hold cover?) - both on carbonate and sandstone? Though, you say the opposite in L296ff

L267 not by fracture distance?

L272 so then - how is the correlation between bedding thickness with local rock dimensions

L272ff several repetitions, shorten; though you could repeat the bedding thickness values/orders for better evaluation of your discussions!

L283ff this section is misplaced and also repeats a lot; have this earlier in the interpretation - also fig9 partly repeats fig.4cd and should not show up here in the discussion; could go to the supplement (or maybe show one example of the rock exposure as a panel in fig.4)

L296 contradicts L304f (and L261) - confusing and circular these two last paragraphs;  
solve for a reasonable, streamlined and consistent interpretation at one place in the text  
CONCLUSIONS  
L318 need to mention Carbonates here?

3. technical corrections

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L39 not necessary

L86/88 repetition

fig1/2 combine into panels

L146 why 40 foot and not [m]?

L189 for on

L209 combine fig.6 and the panels of fig.8 into 4 panels; fig.7 is wrong-placed

fig8 the caption indicates fig6 is added as a panel - do that

fig9 caption: left is right ...; what are the dots?; what are "high-order alluviated channels"; rock-coloring is hard to differentiate