

Interactive comment on “Mass balance, grade, and adjustment timescales in bedrock channels” by Jens Martin Turowski

Anonymous Referee #1

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In this manuscript, the author proposed a mechanistic model for analyzing the adjustment timescales for channel width, channel bed slope and alluvial bed cover in a mixed alluvial - bedrock channel. However, in the current version a significant question on the assumption of the bar wavelength remains and needs to be addressed.

In eq. 23, you assumed that the bar wavelength decreases with decreasing the fraction of alluvial cover. However, recent studies indicate that the bar wavelength increases with decreasing the fraction of alluvial cover in mixed alluvial – bedrock channel, in theoretically (Nelson and Seminara, 2011, Fig.2b, doi: 10.1029/2011GL050806) and numerically (Inoue et al., 2016, Figs 5 and 11, doi: 10.1061/(ASCE)HY.1943-7900.0001124.). Experiments conducted by Chatanantavet and Parker (2008) also show no decrease in bar wavelength. Your assumption is based on Kelly (2006)’s ob-

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servations in alluvial channel, but may not be applicable to mixed alluvial – bedrock channel. Because this assumption directly affects the lateral erosion rate and the timescales, the results shown in Figs 4 – 6 may be incorrect.

Additional comments by line number below:

P2 Eq. (1): The density of the sediment?

P7 Line 9: Auel et al., 2017 a or b?

P7 Line 15: Why does the secondary flow not affect the lateral impact velocity?

P7 Line 32: Nelson and Seminara analyzed alternate bars in a mixed alluvial – bedrock channel in 2012, not 2011. The paper listed in the reference is probably incorrect.

P12 Figure 4c: There is no explanation of Fig4c in the text. Why does slope and width change with uplift rate?

P15. Line 6: Gravel bars do not increase their wavelength as cover increases.

P19 Eq. (B6): When C is close to 0 (i.e., almost completely exposed bedrock), γ is close to 90 degree (i.e., sediments move towards the sidewalls). Why?

P26-P29: Inoue et al. (2014), Montgomery et al. (1996), Shepherd (1972) and Whipple (2004) are not listed in the references.

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