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Interactive comment on "Coupling threshold theory and satellite image derived channel width to estimate the formative discharge of Himalayan Foreland rivers" *by* Kumar Gaurav et al.

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General Comments:

This manuscript presents a novel, potentially quite powerful methodology to extract the formative discharges of ungauged, alluvial rivers, utilizing a combination of an innovative remote sensing technique coupled with a mechanistically-based relationship between river channel width and water discharge from threshold channel theory. Overall, I like this paper. I think it demonstrates a strong linkage between analysis of remotely sensed data and mechanistic theory, allowing for improved understanding of the processes at play in environment where it might be more difficult to employ the standard

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Discussion paper

suite of direct empirical measurements – fluvial geomorphologists working on Martian channels has been doing this for years quite successfully. I find this manuscript to be in good shape overall. I have do have a few minor questions/clarifications that I have outlined below:

Specific comments:

Line 98: When you are defining your variables, you set your threshold Shields parameter equal to 0.3. This is an order of magnitude greater that the more standard range (0.03-0.05) that is usually observed for grains/channels under the flow conditions found in your typical natural river. I am not criticizing the usage of this value in the model, but I believe that it would be beneficial to readers to clarify this discrepancy. The first two authors have published papers where they employed the same threshold model on rivers on the Kosi Megafan and rivers in the Bayanbulak Grassland (this reviewer is incredibly envious of their field sites!), but have used threshold Shields parameter values of 0.3 and 0.04, respectively. Given that the critical shear stress/shields stress is a physical parameter that can be either measured directly or calculated based upon measurable gain size data, I believe that it would be worth explaining departure from the more commonly used 0.03-0.05 values, or at least stating that the usage of this offset 0.3 value has been shown to be effective for explaining the geometry of the category of rivers that the ones used in this study fall under.

Figure 4: The panes that should show both the binary and raw images are empty, am I missing something? Maybe just my computer acting up, but I tried downloading the PDF a few times with no effect.

Line 200: How are the histograms skewed? Is the skewness a result of natural variation in thread width or error in the cross-section selection?

Line 201: What is meant by “post probable?” Median? Modal?

Line 210: Could you explain a bit more how you got from equation 4 to equation 6,

even if you put it in the appendices? Where does the sqrt(g d) come from?

Line 230: Okay so here is where I start to reflect and have a few structural problems with the paper. I think a lot of this material discussing the formative discharge and its control on channel morphology needs to be made earlier on in the paper, either in the introduction or at the point where the authors introduce equation 4. I found myself a bit confused when I was reading the results section (specifically Fig. 8) where estimates of monthly discharge were being made within a threshold channel geometry theoretical framework that isn't really meant to reflect the month to month flow width-discharge relationship, and it took me a while to realize that the main point is that the model does a good job at recognizing formative discharges, but does not do so well when it comes to recognizing discharges below that. I think that the clarity of the manuscript could be improved if the authors clearly introduced earlier on that the goal of the remote sensing analysis coupling with theory would be to identify the formative discharge of the channels. I think this might clarify to the reader exactly what their coupling of threshold theory and satellite imagery analysis is capable of producing.

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