Anonymous Referee #3
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I believe this is an overall excellent piece of work, written by an expert in the field. The issue of sediment transport is a long studied problem and much attention has been paid to traditional criteria, such as Shield's critical shear stresses (as the author notes himself). There are a number of problems using such criteria - as the author mentions in his work (also demonstrated in Fig. 1). However, the author still chooses to deploy this criterion focusing on the fact that data scatter (e.g. in Fig.1) is due to a range of factors, however omitting to discuss its inability to represent the rich dynamics of grain transport, as recent research has shown (Schemeeckle et al. 2003, Diplas et al. 2008).

The major novelty of the present work lays in the presentation of a state function for the description of sediment transport, which is a very much welcomed contribution as a conceptual approach. However, there is a significant concern (to this reviewer) over the suitability of the Shield's shear stress as parameter to be used in this model. Would not other more criteria that capture the full range of grain dynamics, such as instantaneous hydrodynamic forces near the bed or even better the impulse/energy content of flow structures, be more suitable as model parameters? Of course such analysis may offer enough new material for another (and perhaps more impactful) publication, but yet it may be useful to add a note about this on the discussion section.

I appreciate the review and the slightly different perspective it provides. I now cite the work by Schmeeckle and Diplas, and also statistical mechanics descriptions of bedload transport by Furbish et al at the start of section 2.1 (new lines 219-220). In lines 214-221 I also address the reviewer's comment in another way, by more specifically defining the narrower "parameter space" of the model, and the limits of the model. I explicitly state that the model intentionally does not describe timescales of turbulent velocity fluctuations, and I also state that the model is deterministic rather than stochastic. I agree that there are rich bedload transport dynamics over timescales of turbulent velocity fluctuations. I also believe that my model is new and novel in its ability to explore rich morphodynamic feedbacks that have not yet been modeled well, over timescales longer than turbulence.

Because of how Word changes line numbers in the "track changes" version of the manuscript, I note that the line numbers refer to the revised manuscript that does not show all of the edits.

Another, minor issue is with the interpretation of the data analysis. In particular, is there no better measure to assess the "amount of information embedded" between two variables than R2? R2 is rather demonstrative of the strength of association between two variables.

In addition to R^2, I also use RMSD (and define it) in the manuscript. While I am interested in finding new and better statistical tests that could do more than determine the strength of corrrelations between variables, I do not know what other statistics would actually be better for my particular applications, and I respectfully note that the reviewer does not provide any specific suggestion for statistical tests to include either.