Earth **Surface**
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comment

Interactive comment on "Gravel threshold of motion: A state function of sediment transport disequilibrium?" *by* Joel P. L. Johnson

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

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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.

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.

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