Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2017-59-RC2, 2017

Earth Surface Dynamics Discussions
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EGU

Interactive comment on "Quantifying biostabilisation effects of biofilm-secreted and synthetic extracellular polymeric substances (EPS) on sandy substrate" *by* Wietse I. van de Lageweg et al.

Anonymous Referee #2

Received and published: 20 November 2017

The paper examines the difference in the biostabilisation effects of natural biofilm colonisation and synthetic extracellular polymeric substances (EPS) in sand using a series of controlled flume experiments. Using an erosion meter, the critical shares stress required to entrainment clean and colonised sand are derived, and the effect of the preparation procedure for synthetic EPS on these values is investigated. The paper will be of great interest to those working on sediment transport and morphological changes in coastal and freshwater systems. The paper is worthy of publication but I would suggest the authors first explain the novelty of their work, improve the presen-

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Discussion paper

tation of the methods, and consider their confidence in the estimates of critical shear stress. Further details can be found below:

1. The authors provide a very useful review of the literature. However, having done so, I am left wondering what we do not understand, and thus why another study is required? I suggest the authors explain the novelty of their work.

2. I was disappointed the Introduction and Methods section did not make it clear what type of freshwater system is investigated. Which system are the scaled flume experiments trying to represent? I think this is especially important because we are told that one of the motivations for this study is that there has been a lot of work on biostabilisation in coastal settings but not in freshwater systems, and yet the studies biofilms are common in coastal zones. Furthermore, how do the studied conditions (e.g. slopes, depth:width, relative roughness, grain size, Reynolds number) pertain to those found in the natural system and match the conditions commonly found where these biofilms grow? Likewise, the authors should comment on how closely the Cohesive Strength Meter systems mimic erosion processes in the natural system? Furthermore little detail is provided on the setup of the small-scale synthetic EPS experiments. For example, I have read over the paper several times and I still cannot establish whether these tests were performed in a flume.

3. I authors state that synthetic EPS is able “to replicate the sediment stabilising capacity of natural biofilms”. However the authors have found that three times more synthetic EPS concentration is needed to replicate the same stabilising effect of natural biofilms, suggesting the capacity is much higher for natural biofilms.

4. The calibration curve in equation 1 is important for gaining an accurate estimate of the critical shear stress. To allow readers to have confidence in their estimates, the authors should present a graph showing how this curve has been derived, and the predictive performance of this curve. Small deviations from the curve are likely to produce larger discrepancies in critical shear stress estimates due to the non-linear

relationship between critical shear stress and the applied jet force. For example, Figure 4 has error bars to represent the range in estimates from repeats, but hypothetically speaking, how much large would the error bar be if the uncertainty in the estimates themselves was incorporated?

Minor amendments:

1. P4, lines 14-21: There appears to be mismatch between this paragraph and the approach/results. If the prediction of the potential impacts of climate change on aquatic environments and the application of bioengineering adaptation strategies is important, how does this paper address these needs?

2. P9, line 16: What is routine S7?

3. Inconsistencies in the use of et al and author names in citations should be corrected.

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