

Interactive comment on “Impacts of grazing on vegetation dynamics in a sediment transport complex model” by Phillipe Gauvin-Bourdon et al.

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Many thanks the referee for their valuable and constructive feedback on the manuscript. We have addressed all comments made by the referee and offer a response to each concern brought forward by the referee in the following response. Changes to be made to the manuscript will be explained here in response to each comment and will be added to the final version of the manuscript.

We thank the referee for their concern on the framing of the research and for the justification of our work on the integrated vegetation-grazing-sediment transport model. We recognize the need for clarifying its context and the justification of the research

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goals. The non-linearity and capacity to produce emergent patterns of the interactions between the vegetation, sediment transport and grazing are one of the primary reasons we chose to use complex models in this research. Additional description of the dynamics and interactions taking place between the vegetation, the sediment transport and the grazing was added in the introduction to help the reader understand the need for using a complex model in this application. The context section of the original manuscript will also be integrated into the introduction to help link the theory on the dynamics observed in arid environments and the application of those dynamics in models. To help illustrate the comparison of the models and their evolutions in time, a table will be added to the Introduction section also.

We thank the referee for their comment on requesting more clarity on the explanation of the model algorithm. We agree that part of the model might not be completely clear for the reader, since the ViSTA_GrAM model is expanding on the ViSTA_M17 model (Mayaud et al., 2017). Some of the basis of the ViSTA_GrAM model might have been overlooked in the present manuscript, because it is explained in the previously published article on the ViSTA model. That being the case, we agree with the reviewer that some of the variables coming from the ViSTA model could benefit from additional explanation in the manuscript. This will allow us to recontextualize the use of each of these variables and explain their relation of the real world. The significant height of the vegetation is one example of these variables originally linked to the ViSTA_M17 model, but also plays a role in the implementation of ViSTA_GrAM. This variable represents the minimal height of the vegetation for it to influence the capacity of the wind to erode the sediment surrounding that vegetation, and therefore directly connected with the way the ViSTA model treats vegetation growth. The iteration number of grazing event length, on the other hand, is a new variable introduced within the ViSTA_GrAM model to help represent the time scale of a grazing event. It is an equivalent in “real world” time to the number of model iterations executed each time the GrAM function is called. We will put more emphasis on the definition of the terminology used and give further direction for

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the reader to relevant original publications in the method section to eliminate confusion about the model functions.

We also want to address the concern of the referee about the realism of the modelled scenarios and the response of the model as a whole system. We think this can be answered in a similar fashion to the first referee's concern about the lack of real-world environment comparison with the model comparison. A better contextualization of the simulations presented in the present manuscript will help improve what those simulations are representing and give the reader a better context around the conclusions that are drawn from these simulations. The research presented in the present manuscript is a first step towards a more integrated approach to the study of arid environment dynamics. The simulations presented in the manuscript are not considered a final simulation effort for the ViSTA_GrAM in the sense that these simulations do not try to recreate actual case studies of real-world environments but explore the simulation or test the sensitivity of the model in an arid environment climate. Like many complex model approaches, we recognize that the model response as a system will overlook some dynamics of the arid environment, since some of the environmental variables are heavily generalized. In this context, we will then expand the methodology section to better contextualize the simulations presented and expand the discussion on the response of the whole system.

Finally, we want to thank the referee for the additional reference of the grazing representation capacity of the Yan and Baas (2018) model. We will revise the introduction and the context section to represent the Extended-DECAL integration of grazing. The justification of our methodology will also be adjusted accordingly.

We hope these additional explanations and the changes that will be made to the original manuscript respond well to the concerns of the referee. Even if the official dis-

cussion on the article is coming to an end, we are open to further discussion and/or comment via email.

We thank the referee for their valuable help in improving this manuscript.

Best wishes,

Phillip Gauvin-Bourdon

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