Earth Surface Dynamics Discussions

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Comment on esurf-2021-66

Anonymous Referee #2

Referee comment on "Biogeomorphic modeling to assess the resilience of tidal-marsh restoration to sea level rise and sediment supply" by Olivier Gourgue et al., Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2021-66-RC2, 2021

The authors present an eco-geomorphological model with many interesting and novel features and apply the model to a design of a restoration project consisting of breaching of an existing dyke. The paper is very valuable as an application of state-of-the-art modelling to a specific restoration site with all the associated complications and uncertainties.

A critical feature of the model is that it can predict channel formation within the marsh as a result of the new hydrodynamic configuration due to the dyke breaches. It would be very useful to provide more detail on how the process of channel formation is implemented in the model…is there a threshold values of shear stress? Is that a model parameter that is adjusted or calibrated? How does it compare to other sites/models?

Deposition of sediment and surface accretion is also quite important for the model results and there are a couple of points that would be good to have more information on. The first one is about the biological component of accretion, which includes the incorporation of plant litter into the soil (Morris et al., 2002) and that is not included in the model. It may well be that is not as important in this setting, but a comment on this would be valuable. For example, Breda et al. (2021) showed that the biological accretion can be of similar magnitude than the sediment related accretion. Those two accretion components may have a different behaviour under climate change scenarios.

The other point is the formulation for deposition of fine sediment. Cohesive sediment deposition often involves the determination of a minimum depositional velocity below which fine particles (colloids) remain in suspension (Metha and MacAnally, 2008). The model used in the paper does not have a minimum velocity threshold in its formulation, so it would be good to discuss the implications of such approach.

Breda, A., Saco, P. M., Sandi, S. G., Saintilan, N., Riccardi, G., and Rodríguez, J. F. , 2021: Accretion, retreat and transgression of coastal wetlands experiencing sea-level rise, Hydrol. Earth Syst. Sci., 25, 769–786, https://doi.org/10.5194/hess-25-769-2021.

Morris, J. T., Sundareshwar, P. V., Nietch, C. T., Kjerfve, B., and Cahoon, D. R. , 2002: Responses of coastal wetlands to rising sea level, Ecology, 83, 2869–2877, https://doi.org/10.2307/3072022.

Mehta, A. J. and McAnally, W. H. , 2008: Chapter 4: Fine-grained sediment transport, in: Sedimentation Engineering: Processes, Management, Modeling and Practice, edited by: Garcia, M. H., ASCE Manuals and Reports on Engineering Practice, American Society of Civil Engineers (ASCE), Reston, VA, USA.