Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-424-RC1, 2019

Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Assessment of geomorphic effectiveness of controlled floods in a braided river using a reduced-complexity numerical model" *by* Luca Ziliani et al.

Anonymous Referee #1

Received and published: 1 December 2019

The authors apply a 2D reduced complexity morphodynamic model to a 7 km-long reach of the braided Piave River. Their goal is to establish that the model credibly represents changes in channel morphology and to ask whether artificial floods might change the future morphology. The applied interest is maintaining channel width and braiding complexity on a river that is progressively narrowing and simplifying due to water management.

The paper is generally well organized and written clearly, with an appropriate amount of documentation. There are about 25-30 small examples in which a careful copy editor is needed to correct English phrasing. These errors rarely produce ambiguity, but should

be corrected. I did not have time to mark them myself.

The authors do a good job explaining the model and testing its suitability, They approach the difficult issue of matching model prediction and reality with care. My comments are intended to suggest additional means to explain, evaluate, and justify the model results. I think they should be addressed by the authors, although they do not all need to be acted on.

(1) My first look at the test hydrographs (Figure 7.c, d, e) suggested to me that little difference in predicted channel morphology should be anticipated. The controlled floods in Scenarios 2 and 3 are too small and the controlled floods in Scenario 4 are too infrequent (and no larger than natural floods). Presumably the flood scenarios chosen are as large as can be released given the water infrastructure in the basin. Hence, the (not too surprising) result is that the modest or infrequent floods that are feasible are not sufficient to produce significant changes in the forecast channel morphology.

(2) An interesting way to present the results would be in terms of 'limits of prediction'. That is, conduct multiple runs driven by small changes in parameter or initial conditions or in the sequencing of floods, in order to show how variable the results would be given uncertainty of the input. I would guess that the range of predicted width and braiding index (Figure 7.a, b) would comfortably encompass the predictions from the different scenarios, indicating that the model is unable to demonstrate that the available floods would produce different morphologies.

(3) I do wonder whether the model is able to predict larger widths. Is the model capable of predicting a width of, say, 430 m, as observed in 1970? I realize that flows up to 1970 are outside of the calibration range, but I would be concerned about whether the apparently firm upper bound on width of 350 m (Figure 7.a) is somehow an artifact of the model.

(4) The test for sediment transport rate is quite weak: the authors find that the computed transport rates are within typical range for such gravel-bed braided rivers. A

more sensitive test would be to evaluate how the bed grain size changes over time. You specify an initial grain size - does that grain size shift dramatically over the course of the model run?

(5) River are a combination of sediment-feed and sediment-recirculating systems. I suspect that the model results are sensitive to this choice. The problem, of course, is specifying an upstream sediment boundary condition. I would be interested in learning how an increase in sediment supply changes the predicted channel morphology. Perhaps that is beyond the scope of the paper, although the authors do mention that sediment mining was practiced and then halted. Model runs with and without substantial sediment removals would certainly be interesting!

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