

## ***Interactive comment on “Modelling braided river morphodynamics using a particle travel length framework” by Alan Kasprak et al.***

### **Anonymous Referee #1**

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The manuscript presents an effort of modelling braided river morphodynamics by combining a 2D hydrodynamic model and a path-length based algorithm. The topic is relevant to an important issue on the earth surface dynamics, and it is should be interesting to readers of this journal. The aim of present hybrid approach is to develop a new framework of model to predict the braided river processes with limited computation time. Model predictions have been compared with two natural braided river for multi-scalar verification. The object of this study is clear. However, basic method is not described sufficiently, and then it is difficult to estimate the value of the new model. In addition the prediction is not close enough to the measurement even in the statistical meaning, and the discrepancy is not explained enough. Therefore, in my opinion, the current version of this manuscript should be improved before being accepted by the

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journal for a publication. The specific comments are as following: 1. Page 5, Lines 21-25, Section 2.1: It is not clear if time derivatives are included in the model? In the model description, “Delft3D solves the shallow-water form of the Navier-Stokes equations, which related changes in momentum (left-hand terms) in time and space . . .”, while the terms of time derivative are not included in Equations 1-2. 2. Page 6, Lines 1 & 8-9: “Where  $x$  and  $y$ , respectively, denote the streamwise and cross-stream directions of velocity ( $u$ ,  $v$ ), . . .” Does the “streamwise” mean the river direction? Because the “For all modelling, we employed fixed Cartesian orthogonal grids”, and the velocity changes over time and space. It is unclear whether the  $x$  and  $y$  is in a Cartesian coordinate system or other curvilinear coordinate system? 3. Page 8, Lines 15- 20: This part is the key solution of the proposed model framework, however, it cannot be understand clearly how to calculated the morphological change rate by using Equation 7 and with the concept of “integrated sediment transport pathways”. More description and comments are needed at least here. Without a confirmed understanding, the value of the new model cannot be estimated sufficiently and the results would not be analyzed correctly. 4. Page 9, Lines 25-30: It is not clear, when a bank erosion would occurred. Is there any relationship between the “7%” and angle of repose? What is the mean of “we set this threshold area to 30 cells, again adjusting this value to mirror the size of field-observed bank erosion patch”? This part is a key procedure for the river migration, however the meanings are too ambiguous. 5. Page 10, Section 2.4: The general meaning is not clear for this section. Firstly, “velocity vectors need not pass through the centre of each cell.” Why? And what is the result for the “Bed/Bank Sediment Transport and Deposition”? Secondly, how to combine the 5x5 deposition window of cells and the path length distribution in the model? Comments and figures should be used to illustrate the complex an core relationships. 6. Page 12, Line 5: How to determine the  $Z_{ACT}$ ? 7. Page 13, Lines 25-30: DoD means “Difference of DEM” or “DEM of Difference” or others? 8. Page 18, Line 30: There is only a single sub-section 4.2.1 in this section. 9. With regard to results and discussion, it is difficult to assess the agreement and disagreement of predictions without fully understanding of the model.

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