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Discussions

Interactive comment on "Development of high-resolution multi-scale modelling system for simulation of coastal-fluvial urban flooding" *by* A. I. Olbert et al.

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Response to the Reviewer no 2.

Thank you very much for reviewing our paper and your valuable comments. We appreciate your comments and put our best effort to address them. Please find below our responses:

1. p. 6, lines 156 – 168: U and V are not specified The descriptions of U and V are now placed in the manuscript

2. p. 7. Line 196: "befits" should be "benefits" This is now changed

3. Section 2.3: Presumably the child grids have more refined bathymetry than the parent grids. How are mass and volume conservation achieved when moving from the coarse to the fine grid ? While mass conservation is relatively easily achieved, momentum conservation is more difficult and it is the ghost cell treatment of the nested boundary that ensure we achieve conservation of incoming momentum fluxes. As stated at the top of page 13 (line 348) of the manuscript, the tidally-averaged errors in CG30 fluxes (both mass and momentum) relative to PG90 fluxes were less that 2% at both boundaries, demonstrating high levels of conservation from parent grid to child grid. These boundary flux comparisons are shown in Figure 10.

4. p. 11, line 311. The definition of errors should be moved to the Methods (Section 2). Similarly for Equations 5 and 6. Section 2.5 Verification with statistical definitions and equations has been added to the Methods

5. p. 14, line 390. What is the RMSD and how is it different from the RMSE ? These errors have not been defined. Section 2.5 Verification with statistical definitions and equations has been added to the Methods

6. p. 15. The "infrequent random oscillations" in CG06 suggest that the model is being run at the limits of numerical stability, presumably to minimise computation time. The authors might improve the results of CG06 by reducing the time step. Does the marginal stability of CG06 affect the quality of the boundary forcing supplied to CG02 ? We have analysed the outputs of model CG02 forced with boundary conditions provided by various temporal resolution CG06 model and we found that increasing temporal resolution ofCG06 does not have effect on CG02 model performance but significantly slows down the overall computation time.

7. p. 17, line 468. ". . .details of that analysis are presented elsewhere". Where ? Please provide a citation. Details of the analysis are presented in paper under review which is at the moment in the second round of the review. Since we are not in the position to cite the paper yet, we deleted the statement ". . .details of that analysis are

presented elsewhere" from the manuscript.

8. p. 17, line 476. This may be a matter of semantics, but I find the use of the term "Moving Boundary" misleading. The boundaries in this model system do not "move" (unless I have missed something), but they are adjustable and variable in extent. The "moving boundary" term describes lateral contraction and expansion of the nested boundary. We agree that the term may be misleading but has been widely used to describe this process and we adhered to this terminology. Below are a number of references:

Nash, S., Hartnett, M.: nested circulation modelling of inter-tidal zones: details of nesting approach incorporating moving boundary. Ocean Dynamics 60, 1479-1495, 2010.

Shyy W, Udaykumar HS, Rao MM, Smith RW. Computational Fluid Dynamics with Moving Boundaries. Taylor& Francis: London, 1996. Ahmed, SG, Meshrif, SA (2009) A new numerical algorithm for 2D moving boundary problems using a boundary element method. Computers & Mathematics with Applications 58, 1302-1308 NGA, DDT, Phung, NK (2012) Applying Moving Boundary and Nested Grid to Compute the Accretion, Erosion at the Estuary. Recent Progress in Data Engineering and Internet Technology Volume 157 of the series Lecture Notes in Electrical Engineering pp 1-10

9. p. 20, line 570 – 571. I think the indices c and f denote CG06 and CG02 respectively, not the other way around. Yes, c and f denote CG06 and CG02, respectively. This has been now corrected

10. p. 21, line 585. "oppose" should be "opposed". Yes, this has been now corrected

11. p. 23. The Conclusions section is too long and should be shortened. The first paragraph (lines 667 – 675) is a summary, not a conclusion, and could be deleted. The Conclusion should summarise the main findings, starting at line 676. We shortened the first paragraph of conclusions to two sentences.