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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Flood Inundation Mapping of Low-, Medium-, and High-Flow Events Using the AutoRoute Model" *by* Michael L. Follum et al.

Michael L. Follum et al.

follumm@gmail.com

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We would like to thank Referee #1 for their comments and suggestions. We hope this response will address their suggestions and lead to an improved manuscript.

General Issue #1, rephrasing of the title to capture both the development and application parts of the manuscript. We agree with the reviewer that the title needs to be rephrased to incorporate the "development" part of the manuscript. We plan to change the title to: "Improved Accuracy and Efficiency of Flood Inundation Mapping of Low-, Medium-, and High-Flow Events Using the AutoRoute Model".

General Issue #2, the use of a water surface elevation interpolator using IDW is the only new component to AutoRoute and not enough to warrant a separate publication. Although simple, the use of the water surface elevation interpolator produces improved accuracy (filling of holes in floodplain) and computational efficiency of the AutoRoute model. However, it is not the only new component described in this paper. The use of an automated bathymetric estimation within the AutoRoute is also new and is actually more important to the original application of AutoRoute as a connection between hydrologic data and mobility analysis (McKinley et al., 2012). In the revised paper we will emphasize the automatic bathymetric profile component within AutoRoute and it's application for mobility analysis.

General Issue #3, implement a stable solution for fixing the outliers during streamline water depth estimation process. We agree with the reviewer that a method to omit outliers will improve the accuracy of the flood inundation maps. We have recently developed a method within the AutoRoute post-processing script (ARPP) to omit individual outliers by analyzing the calculated depth along the entire reach of the river. In the revised manuscript we will implement and test this new method.

General Issue #4, rerun flood models using LiDar elevation instead of NED elevation. This suggestion was also made by Referee #2. In the revised paper we will test the use of LiDar at a few of the test sites and compare accuracy and computational efficiency.

Specific Issue #1, what constitutes an "accurate" F value? In the revised paper we will provide referenced criteria for what constitutes an accurate F value.

Specific Issue #2, differences between HAND and AutoRoute. The referee is correct that the current manuscript does not highlight the differences between the HAND and AutoRoute model. A more robust description of the similarities and differences between the two models will be added to the revised paper that highlight the need for AutoRoute models when connecting to mobility models (McKinley et al., 2012).

Specific Issue #3, variations in flow depth along river reach in Figure 2b. The referee

is correct that the variations in depth in Figure 2b are caused by individual depth calculations at each cross-section. The implementation of a stable solution for omitting outliers (General Issue #3) in the revised paper will likely remove the large variations in depth along the river reach.

Specific Issue #4, same medium flow rates at IN and CO sites in Table 2. The flow rates for IN (Nystrom, 2013) and CO (Kohn and Patton, 2018) shown in Table 2 are correct.

Specific Issue #5, addition of a figure showing the river networks for the NC and MS sites. A figure showing the streamlines and gage locations for the NC and MS sites will be included in the revised paper.

Specific Issue #6, different spatial resolution reported for NED data. Line 41 will be changed in the revised paper to show the spatial resolution of NED data to be $\sim$9m to match Line 186.

Specific Issue #7, does the land cover dataset have the same resolution as the elevation dataset? The land cover dataset has a spatial resolution of approximately 30m, and is therefore resampled to the same resolution as the elevation dataset. This will be better described in the revised paper.

Specific Issue #8, redundant figures. In the revised paper we plan to consolidate the flood inundation results (Figures 3-9). The goal of the consolidation will be to omit unnecessary figures/subplots, thus focusing on the flood maps highlighted in the results and discussion.

Specific Issue #9, include inundation coverage areas in Table 3. In the revised paper we will include coverage areas (accurately-simulated area, under-simulated area, and over-simulated area) in both Table 3 as well as the results and discussion sections.

Kohn, M. S. and Patton, T. T.: Flood-inundation maps for the South Platte River at Fort Morgan, Colorado, U.S. Geological Survey Scientific Investigations Report 2018–5114,

Available from: https://doi.org/10.3133/sir20185114, 2018.

McKinley, G. B., Mason, G. L., Follum, M. L., Jourdan, M. R., LaHatte, C. W. and Ellis, J.: A Route Corridor Flood Vulnerability System, Geotechnical and Structures Laboratory Technical Report ERDC/GSL TR-12-29. U.S. Army Engineer Research and Development Center, Geotechnical and Structures Laboratory, Vicksburg, Mississippi, 2012.

Nystrom, E. A.: Flood-inundation maps for the White River at Spencer, Indiana, U.S. Geological Survey Scientific Investigations Map 3251, Available from: http://pubs.usgs/gov/sim/3251/, 2013.

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