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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 #2 for their comments and suggestions. We hope this response will address their suggestions and lead to an improved manuscript.

General Issue #1, testing of low and high flow events within 1-D hydraulic models has previously been completed. This paper aims to improve the accuracy and computational efficiency of the AutoRoute model in simulating low-, medium-, and high-flow events. AutoRoute is somewhat unique as it has been applied at the regional- to continental-scale by the U.S. military, but has only been tested against high-flow events (Lines 50-54 and 79-82). We agree with the referee that 1-D hydraulic models often

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Discussion paper

perform better during high flow events, which this study found as well (Line 296). In the revised paper we will add references to this point, including Dey et al. (2019).

General Issue #2, provide more discussion on how AutoRoute flood simulations may scale up both in space and time. In the revised paper we will provide more discussion on how the improvements to the AutoRoute model will lead to more efficient flood mapping capabilities at the regional- and continental- scales. More information will also be provided on how the U.S. Army Coastal and Hydraulics Laboratory utilizes the AutoRoute model for both flood inundation and mobility assessments.

General Issue #3, improved computational efficiency may not warrant publication. Although simple, the use of the water surface elevation interpolator discussed in this paper 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 its application for mobility analysis. We will also discuss how different bathymetric profile methods could be implemented, with a reference to Dey et al. (2019).

Specific Suggestion #1, rerun flood models using LiDar elevation with bathymetry estimations (potentially) already "burned in". This suggestion was also made by Referee #1. In the revised paper we will test the use of LiDar at a few of the test sites and compare accuracy and computational efficiency. We agree with the referee that comparing AutoRoute results using NED and LiDar may provide useful findings.

Specific Issue #1, provide reference for the line "For high flow events the bathymetry in smaller streams can often be ignored. . .". In the revised paper we will remove this sentence and the following sentence that states that bathymetry is more important in

low-flow simulations (Lines 98-100). These sentences will be replaced with a sentence emphasizing the importance of bathymetry in flood model simulations. This new sentence will have references, including Dey et al. (2019).

Specific Issue #2, what constitutes an “accurate” F value? In the revised paper we will provide referenced criteria for what constitutes an accurate F value.

Dey, S., Saksena, S., Merwade, V.: Assessing the Effect of Different Bathymetric Models on Hydraulic Simulation of Rivers in Data Sparse Regions, Journal of Hydrology, 575, 838-851, 2019.

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.

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