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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.

Anonymous Referee #1

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The scope of this draft contains two parts, the first is to evaluate the performance of AutoRoute in different-flow-magnitude scenarios, which is the application part, and the second is to present the improvement of AutoRoute's computational efficiency brought by recent development on its post processing components, which is the development part. However, the current title of this paper only reflects the former one. The authors may consider rephrasing the title to make it more comprehensive. The application part of this draft across seven sites is solid but redundant figures are presented (see comment 8 for more details); the development part is inadequate to be reported as a significant progress. The innovation in method is not adequate to be presented as another paper adding upon the existing AutoRoute papers. Section 2.1 restates what has

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Discussion paper

been done previously, and only Section 2.2 on the AutoRoute post-processing script (ARPP) is the contribution of this draft. However, it only introduces a water surface elevation interpolator using IDW followed by a local depth computation step using the interpolated water surface and the raw terrain. I don't think the technique of ARPP is advanced enough to be marked as a new version of the tool. Overall, I think the content in the current draft is not enough to be reported as a separate scientific contribution that is different from previous AutoRoute publications. Two potential aspects the authors may consider to add to the current draft are (1) a stable solution for fixing the outliers during streamline water depth estimation process; (2) rerun the models on a few sites using the USGS lidar DEM instead of the NED and examine the corresponding change in performance metrics (F&E). Due to these concerns, a major revision decision is recommended to the editors. A set of technical issues and comments for the paper are provided here: 1. Line 15 The use of "accurate" (average F value of 63.3%) doesn't seem rigorous. Above what F score level, can the results be identified as "accurate"? Is that any reference for this definition? 2. Line 44-46 & 55-57 "However, this process relies heavily on pre-computed flow-depth relationships that may be difficult to apply in areas without highresolution DEM or NHD datasets." "Outside the U.S. stream networks (polyline format) for approximately 70% of the world have been created using HydroSHEDS and HydroBASINS datasets (Lehner and Grill, 2013)(see Snow et al., 2015 for an example)." Since both HAND and AutoRoute are raster-based low-complexity models with similar mechanism, the application stated in Line 55-57 overturn the statement in Line 44-46 about the limitation of the HAND approach. The HAND approach should also be able to applied when a regional hydrologic model is set up outside of the U.S. (https://tethys.servirglobal.net/apps/nepal-hiwatviewer/). 3. Figure 2(b) Within the channel zone, there are parts with shallower depth (compared to the rest), what's the reason for this variation? If the channel bottom elevation drops at a constant rate from upstream to downstream, when the water depth varies up and down as shown because they are computed separately cross section by cross section, how can AutoRoute ensure a smooth water surface profile along the streamline? 4.

Table 2 The medium flow for Site IN and Site CO reports the same number. Is this a coincidence, or a typo? 5. Line 173-183 Add a figure with different subplots showing the river network, site location and watershed of each site will be helpful to help readers understand the layout. 6. Line 41 & Line 186 The same NED is reported with different accuracy in different contexts (Line 41 ∼10m vs Line 186 ∼9m). Please change the numbers to a consistent value. 7. Line 186-187 "land cover classifications were obtained from the 2011 National Land Cover Database" Does the land cover raster share the same resolution as the elevation, or a resample process is introduced here? Please clarify. 8. Figure 3-Figure 9 I would rather treat them as 9 subplots of one figure, because they all express the same kind of information. Each plot of a figure in a journal article should have its unique point to present. The results in Table 3 and a figure with subplots showing results at three or four sites should be enough for the readers to get the points. Using the same figure template to make a separate plot for each site is ineffective and mindless. What will you do if you are testing over twenty sites, or over a region-scale river network? If there are a few sites with unique environment settings that result in a different-level accuracy, a separate figure should be created zooming into the spot of interest to demonstrate the point such as the impact of low-lying areas near the river or flat terrains. 9. Line 219-220 "Visually, NC (Figure 6) and MS (Figure 7) have the greatest amount of overestimation during the low flow event, resulting in the lowest ðİŘź values of all the simulations." Rather than only presenting the ratio-type performance metrics F & E, adding other columns for the actual inundation coverage area numbers will help readers get a better sense of the over/under estimation level.

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