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Hydrology and Earth System Sciences Discussions

Interactive comment on "On the uncertainty of stream networks derived from elevation data: the error propagation approach" *by* T. Hengl et al.

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General Comments:

This paper proposes an interesting algorithm for evaluating uncertainty of stream networks by applying the error propagation approach. Because estimation of uncertainty for vector-based geological data has been scarcely achieved compared to that for raster-based data, the proposed algorithm provides a new potential for more sophisticated analysis of geomorphologic data in GIS tools. Even though the proposed algorithm still has some drawbacks for applying it to practical hydrological problems as already discussed by the authors in the manuscript, the simulated results indicate topographic characteristics of the area where more intensive sampling of surface elevation is required for generating stream networks with sufficient accuracy.

The error propagation approach represented in this paper is scientifically well organized and sufficiently explained. Some improvements are required to reduce obscurity as suggested below, but representation quality of the manuscript is generally good. Synthetically, this paper provide a fresh and significant insight for catchment hydrology, and thus worth publishing on Hydrology and Earth System Sciences.

Specific Comments:

- P. 779 L. 18: It is said that "the target variable (z) varies equally in all directions in both study areas". However from Fig.4, it seems that target variable (z) does not vary equally in all directions, especially for large distance. This directional difference may not have significant impact on kriging results because subvariogram for short distance is similar for all directions. This discussion would be better to be included in the manuscript.

- P. 780. L. 24: What "areas of distinct" means?

- P. 782 L. 5: It is said that "streams are especially difficult to map in areas where the difference from the mean value is positive". However, from Fig. 7, it can be said that errors in allocating streams frequently occurs in area where difference from mean elevation is "small", but not "positive". Also, "small" difference from mean elevation should also indicate areas with low local relief. Is the work "positive" mistake of "small"?

- P. 782 L. 8: Meaning of the sentence "it is rewarding to be able to prove these assumptions using hard data" is unclear. Which assumptions and what hard data are discussed in this sentence?

- P. 782. L.12: Explanation of "the kappa parameter" is not enough. At least, it should be described that in which step of this study the kappa parameter is used.

- P. 797. Fig. 5: Uncertainty in stream networks in low relief area and hilltop area may be caused by different reasons. In low relief area, uncertainty is caused by propagated errors in topography, i.e. difficulty in finding proper position of stream in valley.

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Contrastively in hilltop area, uncertainty is rather caused by artificial reason, i.e. if the GIS can find the stream line exceeding minimum length (40 grids) from any realized mountain ridges. These different mechanisms for uncertainty would be better to be included. Furthermore, it is generally hard to find streams in hilltop region in real world. It would be better to change the threshold for detecting streams from "minimum length" to "minimum drainage area". By doing so, artificial uncertainty in generating stream networks will decrease, and hence actual uncertainty caused by propagated error from DEM can be discussed more clearly.

Technical Corrections:

- P. 772 L. 6: "that complex that" may be confusing. "so complex that" may be easy to be understood.

- P. 779 L. 21: It is good to replace nugget, still parameter, range parameters in the same order for Baranja and Zlatibor.

- P. 782. L. 10: "have have ignored"?

- P. 797. Fig. 5: Caption and unit for the color bar are lacking. Is the color bar for elevation in meter?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 767, 2010.