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Hydrology and Earth System Sciences Discussions

Interactive comment on "An algorithm for delineating and extracting hillslopes and hillslope width functions from gridded elevation data" *by* P. Noel et al.

P. Noel et al.

noelphilippe1@gmail.com

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In this paper, the authors develop a method to delineate individual hillslopes from DTM data, and to check the shape of these functions. The idea of the paper is good, but a number of parts of the paper are written in a rather unclear manner. For this reason, I recommend revisions to the paper before it can be accepted. More specifically, my remarks are:

1. There are a disproportionate amount of figures for the amount of text in the paper. The number of figures should be reduced to at the most 12.

Response:

We have removed Figures 1, 2, 3, and 9 (and adjusted the text in the paper accordingly). There are now a total of 12 figures in the revised manuscript.

2. Figure 3 is not referenced in the text.

Response:

Figure 3 has been removed in response to the previous comment.

3. Abstract and introduction: commonest -> most common

Response:

Done.

4. Last sentence abstract: THE hillslope width function, THE entire watershed.

Response:

Done.

5. Second paragraph introduction: the first sentence states "from the divide to the river segment". The sentence after states: "begins at the river segment". Please make consistent.

Response:

The first sentence of the second paragraph now reads: "The hillslope width function (HWF) is defined as the width of the hillslope from the river segment to the divide."

6. Section 2.1. is very difficult to read. It is difficult to understand what exactly is happening. Please expand this section and provide a better explanation.

Response:

Section 2.1 has been revised to make the delineation procedure clearer, particularly

the starting point for the algorithm.

7. Section 2.2.: why not use a threshold of zero meter? Even if a hillslope is slightly convergent (or divergent), it is still convergent (or divergent).

Response:

As described in this section, the threshold value is user-specified, thus in theory any value can be used, though preferably in some way consistent with the precision of the DEM.

8. Section 2.3.1.: which optimization algorithm is used? Please provide an explanation on how it is applied in this particular case.

Response:

There is no formal optimization algorithm; the procedure simply tries to match the original surface area guided by segment slopes. This has been clarified in the revised manuscript.

9. Section 4: what is "sinous" ?

Response:

We have corrected “sinous” to “sinuous”.

10. Please provide a color legend for figure 6. Also, from what I think (and from figure 1), pink is the color for a headwater hillslope. I do not understand how the headwater hillslope can be located where it is located in this figure.

Response:

The colors in Figure 6 (now Figure 3 in the revised manuscript) are not associated to hillslope type but merely identify the different hillslopes extracted by the algorithm. Since Figure 1 has been removed (see our response to comment 1 above), there should no longer be confusion over the colors in Figure 3.

11. Figure 15: If a hillslope is approximated by a triangular shape, and if a model needs to be applied to it, how can the groundwater table discharge water into the stream it the width at the bottom is equal to zero? Water needs a nonzero with in order to be able to flow. Please justify this approach.

Response:

Flow towards this point would not be a problem for a numerical model. The vertex of this triangle would be an outlet for the flow which converges towards it. The computational node at this boundary (or along the vertical projection of this boundary point) can be assigned as a Dirichlet of Neumann boundary condition, or even as part of a seepage face outlet.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/8/C5402/2011/hessd-8-C5402-2011-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 8865, 2011.