

Interactive comment on “A Versatile, Linear Complexity Algorithm for Flow Routing in Topographies with Depressions” by Guillaume Cordonnier et al.

Anonymous Referee #1

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General comments

Depressions are low areas within a digital elevation model that are surrounded by higher terrain, with no outlet to lower areas. Filling them so they are level, as fluid would fill them if the terrain were impermeable, is often necessary in preprocessing DEMs and is a critical step in landscape evolution models.

This paper proposes a new algorithm initially defined in a Computer Graphics implementation of the Stream Power Law that has been improved for better performance. The approach is benchmarked against state of the art algorithms from Barnes (2014) and Wei (2016) both based on a variant of the priority flood approach. The results

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show that the proposed method performs better than the previous ones especially when the number of local minima decreases which is likely to be the case after a few iterations in LEMs. One other advantage of the model is its capacity to account for different flow path enforcement strategies (carving or filling).

I think it is overall well-written, nicely illustrated, to the point, and, most importantly, an interesting and valuable contribution to the modeling of flow routing in DEM and landscape evolution.

Specific comments

Although I think the paper is a valuable contribution as it is, there are a number of points that could be addressed to make it more comprehensive:

1. Although the authors convincingly show how their algorithm performs better than Wei and Barnes serial ones, they quickly mentioned the parallel version of the Barnes 2016 algorithm but don't really show how efficient their approach is compared to Barnes parallel one. Maybe for the intended size of the modelled surface (10's of millions of nodes) Cordonnier's algorithm is faster but it will be nice to have an idea of the time gained.
2. The authors mentioned that the code will be available within the fastscape library. I think it will be greatly beneficial for the algorithm to be available on its own like for the Barnes or Wei ones as there are other problems than LEM where it could be used.

Technical corrections

Page 1, line 9: other problems as well - better specifying 1 or 2 of them.

Page 3, line 8: "we have improved it by using of fast algorithms" delete "of"

Page 3, line 13: "and each of its stages" I will rewrite this part of the sentence

Page 6, line 18: change "Kriskal" to "Kruskal"

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