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Hydrology and Earth System Sciences
Discussions

Interactive comment on "An advanced distributed automated extraction of drainage network model on high-resolution DEM" *by* Y. Mao et al.

a. ye

azye@bnu.edu.cn

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Dear referee #1,

Thank you very much for your excellent comments concerning our manuscript entitled "An advanced distributed automated extraction of drainage network model on high-resolution DEM". All your comments are of much importance and provide us better guidance on paper writing and research work.

We have studied your comments carefully. We would like to try our best to explain the significant role of our modeling strategy in the area of water resources and to revise inadequate address, and lastly we sincerely hope that our responses could reach your satisfaction.

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Interactive Discussion

Discussion Paper

1.“I do not think that this is a relevant problem in the area of water resources for two main reasons. In absolute terms, digital elevation models as large as 400 millions cells can be processed accurately with CPU times in the order of 24 hours. Good programming and adequate RAM equipment is all we need in order to obtain these performances.”

Response: Most automated extraction of drainage network model need to fill sink, compute flow direction, and then compute the accumulation area draining to each grid cell. In order to get continuous and more accurate drainage network,the extraction methods often need to iterative calculate, so the processing procedure requires a long time (hours, even several days) to process a large DEM dataset (Gong & Xie, 2009), some methods evenly can't finish computing. Of course, some simple methods can quickly extract the drainage network, but the drainage network often isn't continuous or it need manual check and revise, it is very expensive and hard to finish in a large basin(e.g. Yangtze River) with high resolution DEM(e.g. 1s). As we know the discontinuous drainage network can't been used to hydrological model in the area of water resources. Especially in the future, when using the 1s or 1m resolution of digital elevation models, the current methods won't achieve it. Furthermore, the algorithm to extract continuous drainage network is recursive, if we want to obtain continuous and more accurate drainage network, digital elevation models as large as 400 millions cells can't be processed accurately with CPU times in the order of 24 hours.

Gong J, Xie J, 2009. Extraction of drainage networks from large terrain datasets using high throughput computing. Computers & Geosciences 35, 337-46.

2.“In relative terms, river network extraction is a preprocessing task in hydrological modeling, and the computational costs required to describe runoff generation and propagation processes are much greater. State-of-the art methods for the determination of river networks from high-resolution digital elevation models are accurate and computationally efficient.”

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Response: We agree with this view. “The river network extraction is a preprocessing task in hydrological modeling, and the computational costs required to describe runoff generation and propagation processes are much greater.” However, this can’t prove that the river network extraction is not important. This manuscript mainly pay attention to the extraction of high-resolution and high-accuracy drainage network, and doesn’t consider much about ‘the computational costs required to describe runoff generation and propagation processes’. Therefore, this comment may be not much relative to our objective.

3.“With respect to existing methods, the authors’ work does not make a significant new contribution to the area of water resources in my opinion.” Response: We proposed an advanced distributed automated extraction of drainage network model (Adam) in this paper. The new method is different with other methods, which search upward from outlet of basin instead of sink filling base on subbasins. So Adam is to get continuous drainage network and more efficient than other methods. A high-resolution and high-accuracy drainage network map is a prerequisite for simulating the water cycle in land surface hydrological models. Its quality largely determines the simulation results of water cycle. Based on the analysis of current drainage network products, almost all products are obtained from digital elevation models data, while none has make it on the latest and highest resolution digital elevation models, such as 1s resolution digital elevation models. The obstacle for this problem is the limitation of computer resources and computation time. Therefore, to develop an advanced method to extract high-quality drainage network on high-resolution digital elevation models plays a significant role in the area of water resources.

4.“In any case, several important points are inadequately addressed in the authors’ investigation. Specifically: 1) the review of the existing literature on the subject is incomplete; 2) the original contribution provided by the authors is inadequately identified; 3) the improvement offered by the proposed modeling strategy over existing methods is inadequately shown.”

HESSD

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Response: This comment is much useful for improvement of our manuscript, and we will revise carefully and detailly by completing the existing literatures and elaborating our proposed modeling stately.

We would like to express our great appreciation to you for comments on our paper. Looking forward to hearing from you. Thank you and best regards. Yours sincerely, Aizhong Ye

Corresponding author: Name: Aizhong Ye e-mail: azye@bnu.edu.cn College of Global Change and Earth System Science, Beijing Normal University 19# Xinjiekou Road, Haidian, Beijng, China, 100875 Tel.: +8610-13439957134

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