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# A new method combining Priority-Flood and Advanced D8 algorithms to extract drainage networks based on DEMs

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Drainage networks, and the associated channel links and drainage basins, are fundamental concepts in earth science. Automatic extraction of drainage networks is an important component in digital terrain analysis and hydrology analysis such as distributed hydrological model, soil erosion, etc. Extensive researches have been conducted on extraction of drainage networks, but the problem of parallel drainage networks still exist in some flat areas by using existing methods. Because calculating flow direction by the cell slope is the vital point of extracting drainage networks, proposing an effective method to get the right flow direction is necessary to solve the problem of parallel flow lines. Hence, in this research, we propose a new drainage networks extraction method combining Priority-Flood and D8 algorithms without filling depressions to resolve the problem of parallel flow lines. The most important advantage of Priority-Flood algorithm is ensuring the correctness of the flow direction on macro terrain and avoiding the process of depression-filling to eliminate the parallel drainage networks is another significant reason. Meanwhile, advanced D8 algorithm takes suitable calculation methods of flow direction based on different terrains to improve the accuracy of drainage networks, which ensure the water pour out from depression. We compare the results from the new method and the J&D algorithm of four different areas including the Alps, the Loess Plateau, the Rocky Mountains and the Qinghai-Tibet Plateau and we can see that the new method has the obvious advantages of avoiding the parallel flow lines. To evaluate the accuracy of this new method and the J&D algorithm, we use drainage-networks-matching-difference to make quantitative description of errors in the extraction of drainage networks, which is the ratio of the sum of area of sliver polygons to the total length of the real drainage networks. According to the results of drainage-networks-matching-difference, it is shown that average drainage-networks-matching-difference of new method is better than it of the J&D algorithm, which means the drainage networks extracted by new method are closer to the real drainage networks. The algorithm proposed here could reduce parallel flow lines and improve the accuracy from DEMs.