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Non-dispersive flow path retrieval using a global search scheme

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Extracting flow paths from digital elevation models has become an important issue in surface water hydrology and various algorithms have been proposed. These can be grouped into two types, i.e., dispersive methods which inevitably bring planar dispersion and non-dispersive methods such as the deterministic eight-neighbor flow direction retrieval algorithm (D8). To investigate transport of water, sediment, nutrient, pollutant, etc. through stream channels, specific flow paths without planar dispersion have to be defined; therefore non-dispersive methods should be used. However, widely used non-dispersive algorithms, such as D8, suffer serious uncertainty in their determined flow directions due to the lack of variability in flow directions. Although the uncertainty at local level is an inherent problem residing in the domain discretization, I found that more reasonable flow direction at the global scale can be achieved by maximizing the use of all information stored in the given digital elevation data. In this study, an alternative approach is proposed to reduce the uncertainty by utilizing information stored cells other than nearby vicinity. The proposed algorithm makes significant improvement over D8 whilst it is still simple and computationally efficient.