A Comparative Evaluation of the VPMD and MCT Flood Routing Methods

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The recently proposed physically based Muskingum-Cunge-Todini (MCT) flood routing method [1] is compared with a similar variable parameter Muskingum discharge (VPMD) routing method advocated by Perumal [2]. These two routing methods have been specially chosen in this study since both have the capability to vary the parameters of the routing methods in a physically based manner. Twenty five numerical experiments as considered by Todini [1] were conducted with (Δt = 0.5 h) by using these MCT and VPMD methods to route different characteristics of flood waves in the form of the Pearson type-III distribution in a 100 km length rectangular channel reaches, each characterized by a uniform bed slope and Manning's roughness coefficient. The solution of the full SV equations for each case is used as the benchmark solution. Four performance evaluations measures, viz., Nash-Sutcliffe criterion, error in volume, error in peak discharge and its time to peak discharge were considered to test the efficacy of the VPMD and MCT methods. It is inferred from the preliminary study that although the MCT and VPMD methods are heterogeneous in terms of estimating the model parameters (i.e., travel time and weighting coefficient), they perform almost equally well in the overall reproduction of benchmark hydrographs and in volume conservation with a comparatively better performance of the VPMD method over the MCT method when small number of routing reach sub-divisions were used. It is concluded from this study that for the hydrological analyses of gauged and ungauged basins, the MCT method can be satisfactorily used only at finer spatial resolutions, whereas the VPMD method can always be used at relatively coarser resolutions.

References

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