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A New Discretization Approach for Delineating Hydrologically Similar Units in Watersheds Using Soil Hydraulic Properties

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Discretization of a watershed into hydrologically similar units (HSU) is a key step for evaluating hydrologic response in a watershed. We developed and tested a new discretization scheme based on the fuzzy classification of soil hydraulic properties. A fuzzy inference system (FIS) was developed based on the saturated hydraulic conductivity (Ks) and van Genuchten water retention parameters α and n data from a local database generated from the Dengei Pahad micro-watershed (DPW) near Chilika Lake of India. Application of fuzzy approach to a larger international database of soil hydraulic properties revealed that the developed hydrologic classes are quite comparable across two different databases. The HSUs were demarcated on the basis of developed FIS to discretize a watershed. For the DPW, this approach resulted in five distinct HSUs, which were more similar within a unit than between units. The evaluation of this new discretization scheme using SWAT modeling environment showed better performance than the soil series-based discretization approach.