Tool for defining catchment similarity matrix

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It is important to classify catchments for many reasons, for example, for prediction in ungauged basins, model parameterization and watershed development. There have been many studies on catchment classification, but no silver bullet exists for choosing the most relevant measure of catchment similarity. The aim of this study is to explore a new measure of similarity among catchments, using a data depth function. We used a similarity measure called "Depth-Depth plot" (DD-plot) which measures similarity in the catchment flow dynamics in multiple dimension. The area under the convex hull of DD-plot can be used as similarity matrix to any clustering technique. In this study we used Affinity propagation (AP) clustering algorithm for grouping the similar catchments. Catchment classifications based on flow and physical characteristics were compared. We evaluate whether the similarity based on depth-depth plots provides a better basis for transferring parameter sets of a hydrological model between catchments. We used a case study of 21 catchments located in the Bay of Plenty region in the North Island of New Zealand. The catchments have a wide range of topographic properties, response behaviours and geological features. The TopNet hydrological model was calibrated for all the catchments and the transferability of model parameters among the similar catchments was tested by transferring the parameters from within the cluster group and outside the group. The results of parameter transferred with in group based on Nash-Sutcliffe coefficient are promising. Results also show that clustering based on our proposed depth-depth measure, catchment characteristics, flow, and flow indices are different. The catchment classification of this study can be used to improve regional flood forecasting capabilities.