Some delineation rules for watershed representation in Kineros2 model

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One of broadly accepted event-based surface hydrological models is Kineros2, developed by USDA-ARS. Being a model, it needs parameters. Parameterization process for a watershed takes the largest part of modeling process. Therefore there is an effort made by ARS and EPA to develop a GIS-based tool for automatic watershed parameterization. It is called AGWA, and it's already available to users. But it is still under development process.

One of the issues for improvement is detail level in watershed delineation depending on different hydrological characteristics for peak and total runoff prediction. Especially it is important in case of some disturbed area present, for example, parking lots or mining sites. Is it reasonable to single out this area and make it an additional unit for future separate model treatment? Or if its impact on the outcome is not significant, can some kind of 'equivalent' parameter set be used for the whole area including this disturbed one? The challenge is to know apriori whether it is reasonable to have a detailed representation of watershed units, or for modeling purposes given some tolerance level it's satisfactory to use 'lumped' parameters.

The analysis is implemented on two kinds of rainfall patterns: constant intensity one and triangular hyetograph one. From all input parameters of Kineros2 only 11 ones are considered, since they are believed to have the most influence on values of interest from theoretical point of view. These parameters are a subject for sensitivity analysis by Sobol' method, which helps to order parameters based on their total contribution on the response function (peak flow or total runoff). After this procedure the number of parameters is reduced and High Dimensional Model Representations (HDMR) are

built for disturbed and undisturbed conditions for each of the response functions. This is done through orthonormal polynomials in L^2 space, so that the measure of approximation is variance explained. These constructed HDMRs can be used as guidance for answering the key question when disturbed area has a large influence on runoff and when it's not.

The quality of prediction is tested on synthetically built watershed geometries with constant intensity, triangular and some other shape hyetographs.