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Karst aquifer dynamic modelling by evolutionary polynomial regression

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Evolutionary Polynomial Regression (EPR) is an evolutionary modelling technique which has been successfully applied to multiple problems related to environmental engineering. In particular, it proved quite effective at modelling the dynamic relationship between groundwater levels and rainfall heights for a specific case study related to a porous aquifer. This paper introduces an application of EPR aimed at modelling the relationship between rainfall heights and groundwater tables of a karst aquifer.

From a hydrogeological point of view, a karst aquifer is characterized by a quick response to rainfall due to the preferential paths through the ground. It has been monitored over the years thus producing a reasonably long dataset covering about 44 years. On the one hand, these data show some discontinuities, but on the other hand, they are available from a well located in a neighbourhood where there is almost no pumping as well as further disturbances related to human activities.

The use of multiobjective EPR will allow finding a set of feasible symbolic models which helps to make a robust choice of models as well as to investigate about the structures of the models and how the aquifer response is influenced by rainfall.

The authors makes also a comparison with the results they found for the porous aquifer, thus trying to assess which differences exist, from the physical point of view, between the two cases study and the capability of EPR at catching a quicker dynamics. Finally, it is noteworthy that the investigated aquifer is relatively geographically close to the already investigated one, about 40 km. This will also allow for investigating the effect of rainfall change, in terms of intensity variations, on differently structured aquifers whereas there is a similar climate regime.