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Can the super model (SUMO) method improve hydrological simulations? Exploratory tests with the GR hydrological models

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Errors made by hydrological models may come from a problem in parameter estimation, uncertainty on observed measurements, numerical problems and from the model conceptualization that simplifies the reality.

Here we focus on this last issue of hydrological modeling. One of the solutions to reduce structural uncertainty is to use a multimodel method, taking advantage of the great number and the variability of existing hydrological models.

In particular, because different models are not similarly good in all situations, using multimodel approaches can improve the robustness of modeled outputs.

Traditionally, in hydrology, multimodel methods are based on the output of the model (the simulated flow series). The aim of this poster is to introduce a different approach based on the internal variables of the models. The method is inspired by the SUper MOdel (SUMO, van den Berge et al., 2011) developed for climatology.

The idea of the SUMO method is to correct the internal variables of a model taking into account the values of the internal variables of (an)other model(s). This correction is made bilaterally between the different models. The ensemble of the different models constitutes a super model in which all the models exchange information on their internal variables with each other at each time step. Due to this continuity in the exchanges, this multimodel algorithm is more dynamic than traditional multimodel methods.

The method will be first tested using two GR4J models (in a state-space representation) with different parameterizations. The results will be presented and compared to traditional multimodel methods that will serve as benchmarks. In the future, other rainfall-runoff models will be used in the super model.

References

van den Berge, L. A., Selten, F. M., Wiegerinck, W., and Duane, G. S. (2011). A multi-model ensemble method that combines imperfect models through learning. *Earth System Dynamics*, 2(1) :161–177.