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Validation of multi-input ensemble simulation with a spatially distributed hydrological model in Rijnland, the Netherlands

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There are many hydrological data sources that are available from in-situ measurements, remote sensing, and atmospheric modelling, and that can be used to improve water management and understanding of hydrological processes. Each source comes with its own strengths and weaknesses, whether it is in accuracy, availability, measurement frequency, coverage or spatial resolution. By using multiple combinations of available data sources as input to a hydrological model, an ensemble prediction can be generated.

Multi-model ensemble methods originate from the use of different numerical weather prediction (and climate) models. Most research on multi-model hydro-meteorological ensemble prediction has been done on the basis of different hydrological models. With the increase of reliable hydro-meteorological data sources, a re-visit of the multi-model approach is warranted, focussing on multiple combinations of inputs and models.

In this paper, multiple data sources are fed into a hydrological model, resulting in an ensemble of model outputs. The data sources used to generate ensemble members include 2 precipitation sources from in-situ stations and ground-based radar, 3 land use maps from local origin and from satellite estimates, and 2 evapotranspiration estimates from in-situ measured reference evaporation and from satellite estimates through surface energy balance analysis. The land use data were generated by spectral classification of SPOT satellite images, and the remotely sensed evapotranspiration by solving the surface energy equation using Terra MODIS satellite images. The spatially distributed hydrological modelling system SIMGRO is used. The model simulates hydrological process of the Rijnland area in the Netherlands. The ensemble output is analysed by comparing model outputs with observed discharge. The results will be presented and serve to discuss the advantages and disadvantages of applying the multi-input ensemble approach for hydrological prediction.