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HYDROGEIOS: a semi-distributed GIS-based hydrological model for modified river basins

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Abstract. The HYDROGEIOS modelling framework represents the main processes of the hydrological cycle in heavily modified catchments, with decision-dependent abstractions and interactions between surface and groundwater flows. A semi-distributed approach and a monthly simulation time step are adopted, which are sufficient for water resources management studies. The modelling philosophy aims to ensure consistency with the physical characteristics of the system, while keeping the number of parameters as low as possible. Therefore, multiple levels of schematization and parameterization are adopted, by combining multiple levels of geographical data. To optimally allocate human abstractions from the hydrosystem during a planning horizon or even to mimic the allocation occurred in a past period (e.g. the calibration period), in the absence of measured data, a linear programming problem is formulated and solved within each time step. With this technique the fluxes across the hydrosystem are estimated, and the satisfaction of physical and operational constraints is ensured. The model framework includes a parameter estimation module that involves various goodness-of-fit measures and state-of-the-art evolutionary algorithms for global and multiobjective optimization. By means of a challenging case study, the paper discusses appropriate modelling strategies which take advantage of the above framework, with the purpose to ensure a robust calibration and reproduce natural and human induced processes in the catchment as faithfully as possible.

- [Final Revised Paper](#) (PDF, 3842 KB)
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