HYDROGEIOS, an integrated model for simulating complex hydrographic networks - A case study to West Thessaly region

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Introduction

HYDROGEIOS is a physically-based scheme that integrates a conjunctive hydrological model and a systems-oriented management model, through a semi-distributed schematisation. It uses geographical, hydrological and water management data to reproduce the observed operation of a hydrosystem. Various modules are combined to represent the main processes at the geographical, hydrological and water management data to reproduce the observed operation of a hydrosystem. Various modules are combined to represent the main processes at the watergeographical, hydrological and water management data to reproduce the observed operation of a hydrosystem. Various modules are combined to represent the main processes at the water

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The Western Thessaly hydrosystem

- Watershed area of 6087.5 km², lying on three prefectures.
- A main river branch (Penios) and five important tributaries.
- Extended irrigated areas supplied by both surface and groundwater resources, as well as by water diverted from the neighbouring Plastiras reservoir.
- Relatively poor infrastructures.
- Many authorities, with different interests, involved in water management.

Surface hydrology processes

- A physically-based approach is implemented, by assigning model parameters on the basis of the physical characteristics of the watershed. This is ensured through the use of hydrological response units (HRUs), which are spatial components that correspond to areas with homogenous hydrological characteristics.

- The surface hydrosystem comprises the river network and the sub-basins upstream each node. For each sub-basin and HRU combination, a conceptual soil moisture accounting model runs to compute the transformation of precipitation to real evapotranspiration, deep percolation and flood runoff, the latter, together with the estimated spring runoff (baseflow) is directly transferred to the downstream node of the corresponding basin.

Groundwater hydrology processes

- A Darcian multi-cell scheme is established, based on a non-rectangular discretisation of the groundwater system. Each cell is represented as a conceptual tank, with specific porosity values transferred to the downstream node, (c) pumping from each borehole.

Optimal allocation of hydrosystem fluxes

- Calculation of all hydrosystem fluxes, by transforming real components to digraph components, assigning virtual inflows, unit costs and capacities, and solving a linear programming problem

Input data and schematisation

- The river network consist 13 nodes, 12 river segments and 12 sub-basins
- Layout of the irrigation network: the water needs were estimated on the basis of cultivated areas

Conclusions - Proposals

- The model fitting is satisfactory, taking into account the complexity of the hydrological processes, the simplifications regarding the hydrosystem operation, and the various errors contained in the observed data used in calibration.
- The optimised parameters are consistent with the physical characteristics of the basin.
- The schematic procedure was driven by the calibration, regarding some critical features of the model and management practices.
- The results may be used as the basis of an integrated water management plan for the study area, whereas the model can be extended as a planning and assessment tool for new hydraulic projects and management practices.

Acknowledgments - Contact info

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