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The JGrass-NewAge System for Forecasting and Managing the Hydrological Budgets at the Basin Scale

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The work presents and discuss the predictive capacity of the first implementation of the semi-distributed hydrological modeling system JGrass-NewAge. This model focuses on the hydrological balance of medium to large basins, and considers statistics of the processes at hillslope scale. The whole modeling system consists of six main parts: (i) estimation of energy balance; (ii) estimation of evapotranspiration; (iii) snow modelling; (iv) estimation of runoff production; (v) aggregation and propagation of channel flows, and (vi) description of intakes, out-takes, and reservoirs. However, this paper deals with the processes, of runoff production, and aggregation/propagation, neglecting the other components. The system is based on a hillslope-link geometrical partition of the landscape, so the basic unit, where the budget is evaluated, consists of hillslopes that drain into a single associated link rather than cells or pixels. To this conceptual partition corresponds an informatics implementation that uses vectorial features, and raster data.

Runoff production at each channel link is estimated through a combination of the Duffy (1996) model and a GIUH model for estimating residence times in hillslope. Routing in channels uses equations integrated for any channels' link, and produces discharges at any link end, for any link in the river networks.

The model has been tested against measured discharges according to some indexes of goodness of fit, after an appropriate calibration. The characteristic ability to reproduce discharge in any point of the river network is used to infer some statistics, and notably, the scaling properties of the modeled discharge.