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# GEOMODEL: integrated geomorphic model of the hydrologic response

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The effective management of hydrological systems can greatly benefit from reliable models describing hydrological fluxes and storage both in space and time. Such management objectives require models capable of i) reproducing system functioning as described by observations (e.g. rainfall, surface and subsurface flow, etc.); and ii) predicting system functioning under conditions and during events which have not been observed, possibly generating statistical ensembles of events. The formulation of transport by travel time distributions serves well the above scopes in a framework somewhat broader and more comprehensive than the original approach. In fact, the above is extended to tackle arbitrary patterns of rainfall in a spatially distributed framework (which is however lumped in its dynamical specification). The description of the hydrological fluxes and storage both in space and time is strictly connected to the runoff production processes that take place at the hillslope scales. The Runoff production at the hillslope scale is incorporated into larger models of the hydrologic response via the Green-Ampt approach (for shallow soils) incorporating the key information obtained from remote sensing techniques which provide the spatial distribution of soil use. In the model proposed the spatial variation in colluvial soil thickness is determined starting from high resolution digital elevation data for divergent slopes of a watershed in order to assess the hydrological storage volume during a flood event on a geomorphological basis. The assessment of the patterns of soil layer depth on geomorphological bases constitutes an important step towards the development of a model of the hydrologic response that is entirely based on local and observable (remotely) properties of the basin. The basic geomorphologic assumptions pertain the different dynamics of

runoff production in topographically convergent or divergent sites, with a view to the effect of soil depths as seen through different models of soil production. As such, this class of models seems to qualify as a fully geomorphic framework for the computation of the hydrologic response at the catchment scale. A description follows on the application of the model to the Brenta river basin in Northern Italy (1500 $km^2$) and the comparison between the results achieved by testing the runoff production model described above against classical models (i.e. SCS and Green-Ampt) in the simulation of the outgoing flow at the outlet of the basin (Bassano del Grappa).