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The PDM rainfall-runoff model

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The Probability Distributed Model, or PDM, has evolved as a toolkit of model functions that together constitute a lumped rainfall-runoff capable of representing a variety of catchment-scale hydrological behaviours. Runoff production is represented as a saturation excess runoff process controlled by the absorption capacity (of the canopy, surface and soil) whose variability within the catchment is characterised by a probability density function of chosen form. Soil drainage to groundwater is controlled by the water content in excess of a tension threshold, optionally inhibited by the water content of the receiving groundwater store. Alternatively, a proportional split of runoff to fast (surface storage) and slow (groundwater) pathways can be invoked with no explicit soil drainage function. Recursive solutions to the Horton-Izzard equation are provided for routing flows through these pathways, conveniently considered to yield the surface runoff and baseflow components of the total flow. An alternative routing function employs a transfer function that is discretely-coincident to a cascade of two linear reservoirs in series. For real-time flow forecasting applications, the PDM is complemented by updating methods based on error prediction and state-correction approaches. The PDM has been widely applied throughout the world, both for operational and design purposes. This experience has allowed the PDM to evolve to its current form as a practical toolkit for rainfall-runoff modelling and forecasting.