



Comparison of rainfall-runoff modelling approaches for flash flood modelling in Oman

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Rainfall-runoff models are commonly used to predict the peaks, volumes and time-to-peak of flash floods in arid regions. A range of types of rainfall-runoff model have been used for this purpose, including multiple linear regression, unit hydrographs, non-linear soil moisture models linked with linear routing models, and complex non-linear physics-based models. The latter two types of model may be spatially lumped or distributed. The applicability of all of these types of model to flash flood forecasting is primarily restricted by limited data availability and reliability, and the time required to identify and apply the model as part of the flood forecasting procedure. Therefore, the relevant operational questions to guide choice of modelling approach, given the limitations of available data, are 'which model type provides the best accuracy with acceptable modelling effort?' or 'which model is the simplest to apply to achieve acceptable accuracy?' These questions are addressed here by application of three different modelling approaches to flood forecasting in an arid catchment in Oman using hourly data. The three models used are: 1) a multiple linear regression of flood characteristics against rainfall properties and antecedent conditions; 2) a semi-distributed version of a well-known simple conceptual model, IHACRES; 3) a distributed physics-based model, KINEROS2. The relative success in predicting flood peaks, volumes and times-to-peak for 27 flood events which occurred in the period 1996 to 1999 are reported and discussed. Given the available data (which is of better quality than typically available in arid regions) the simpler models are preferred because they achieve similar accuracy to the more complex type. The reasons for this are discussed with respect to the stochastic nature of the rainfall and flow data, the information content in the data, model complexity and calibration techniques. Some ideas

are presented about how we might achieve better models for this type of application.