Texas A & M University and U.S. Bureau of Reclamation
Hydrologic Modelling Inventory
Model Description Form
July 18, 2007

Name of Model:

Rainfall-Runoff Modelling Toolbox (RRMT) & Monte-Carlo Analysis Toolbox (MCAT).

Model Type:

Lumped Conceptual Modelling Framework.

Model Objective(s):

The toolkit allows the development (RRMT) and analysis (MCAT) of conceptual or metric-conceptual models.

Agency and Office:

Environmental and Water Resource Engineering Section, Department of Civil and Environmental Engineering, Imperial College of Science, Technology and Medicine.

Technical Contact and Address:

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Model Structure or Mathematical Basis:

A range of generic tools is provided for model building, calibration and uncertainty analysis. The user can choose between different conceptual or data-based mechanistic model components as a function of modelling objective, data availability and catchment characteristics.

Model Parameters:

Depending on selected model components.

Spatial Scale employed in the Model:

All model structures are spatially lumped.

Temporal Scale employed in the Model:

Ranges from minutes to months.

Input Data Requirements:

Depending on selected model components, typically: Rainfall, and temperature or potential evapotranspiration.

Computer Requirements:

RRMT and MCAT require Matlab Version 5.x. Both toolboxes are developed under MS Windows.

Model Output:

All model structures estimate streamflow at the catchment outlet. Internal states (e.g. soil moisture) and estimates of actual evapotranspiration are calculated depending on the selected model structure.

Parameter Estimation / Model Calibration:

Population evolution, system identification techniques and Monte-Carlo methods are available and can be used when appropriate. MCAT also allows investigation of the results of multiple objective calibration exercises.

Model Testing and Verification:

The applicability of the modelling toolkit has been corroborated by a number of successful studies including data sets from the USA, the UK and Southern Africa. These catchments range from wet to very dry, and their size from a couple of hundred to almost 10000km^2.

Model Sensitivity:

Sensitivity analysis is assumed to be an integral part of each modelling procedure performed using the toolkit. The sensitivity method implemented is a modification of the well-known Regional Sensitivity Analysis.

Model Reliability:

Model reliability is tested as an integral part of the model building and analysis procedure.

Model Application / Case Studies:

Two applications demonstrate the modelling philosophy on which the modelling toolkit is based. The first example demonstrates the use of multiple objectives to analyse parameter sensitivity and identifiability. The second example shows the trade-off between parameter identifiability and model performance due to the selected model complexity.

Documentation:

User manuals for both toolboxes are available.

Other Comments:

The philosophy behind the development of the presented toolkit is based on the need for a parsimonious, i.e. simple in terms of number of parameters, model framework, which allows its user to select or develop an appropriate model structure due to her or his needs. This approach is based on the assumption that no model structure is suitable under all circumstances and a generic modelling framework is therefore required.