A monthly water balance model for assessing streamflow uncertainty in hydrologic studies

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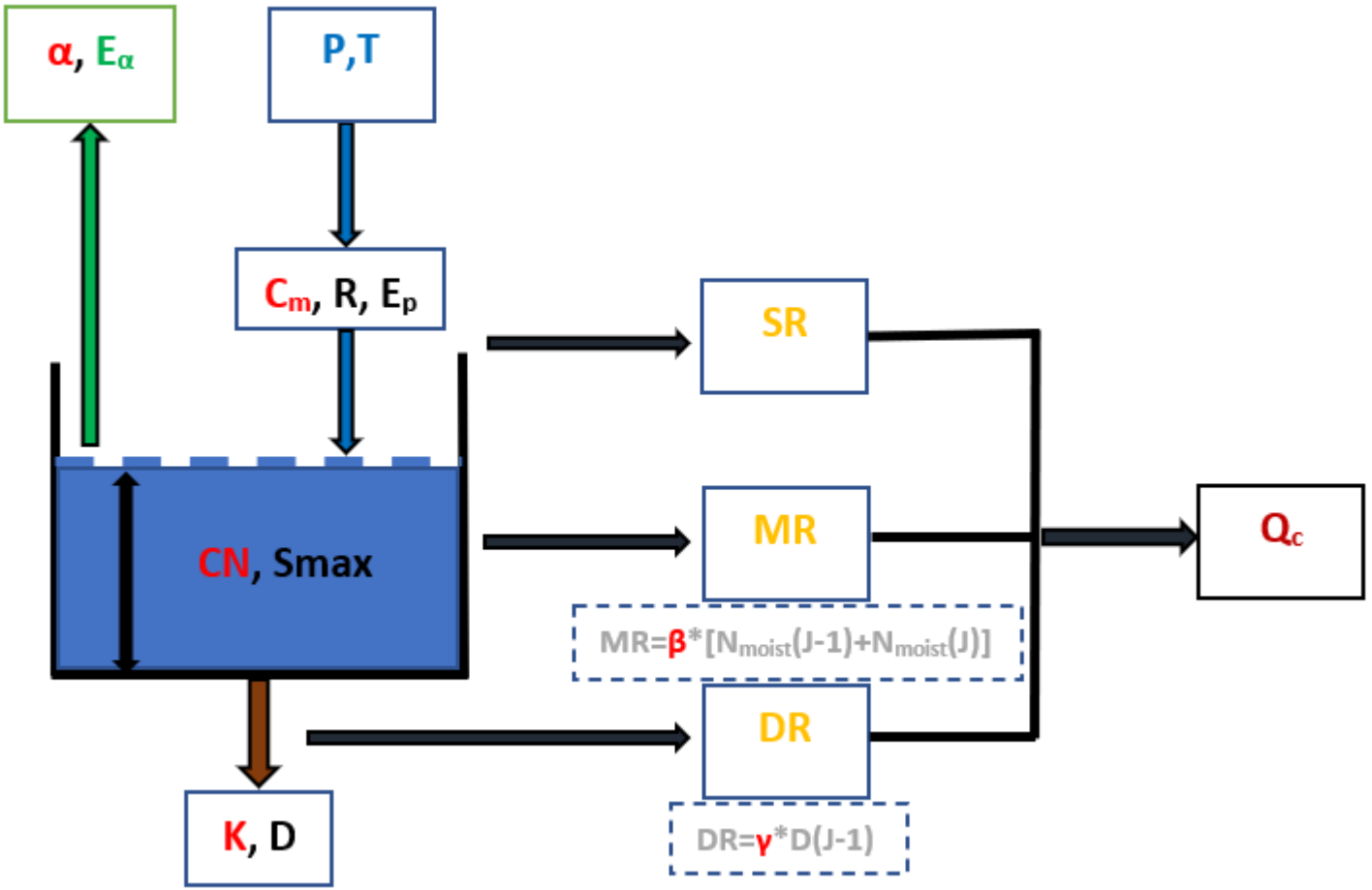
OUTLINE

- The UTHBAL model
- HydroPSO algorithm
- The R-UTHBAL model
- Portaikos river watershed
- Application and Results

UTHBAL MODEL

Flow Diagram



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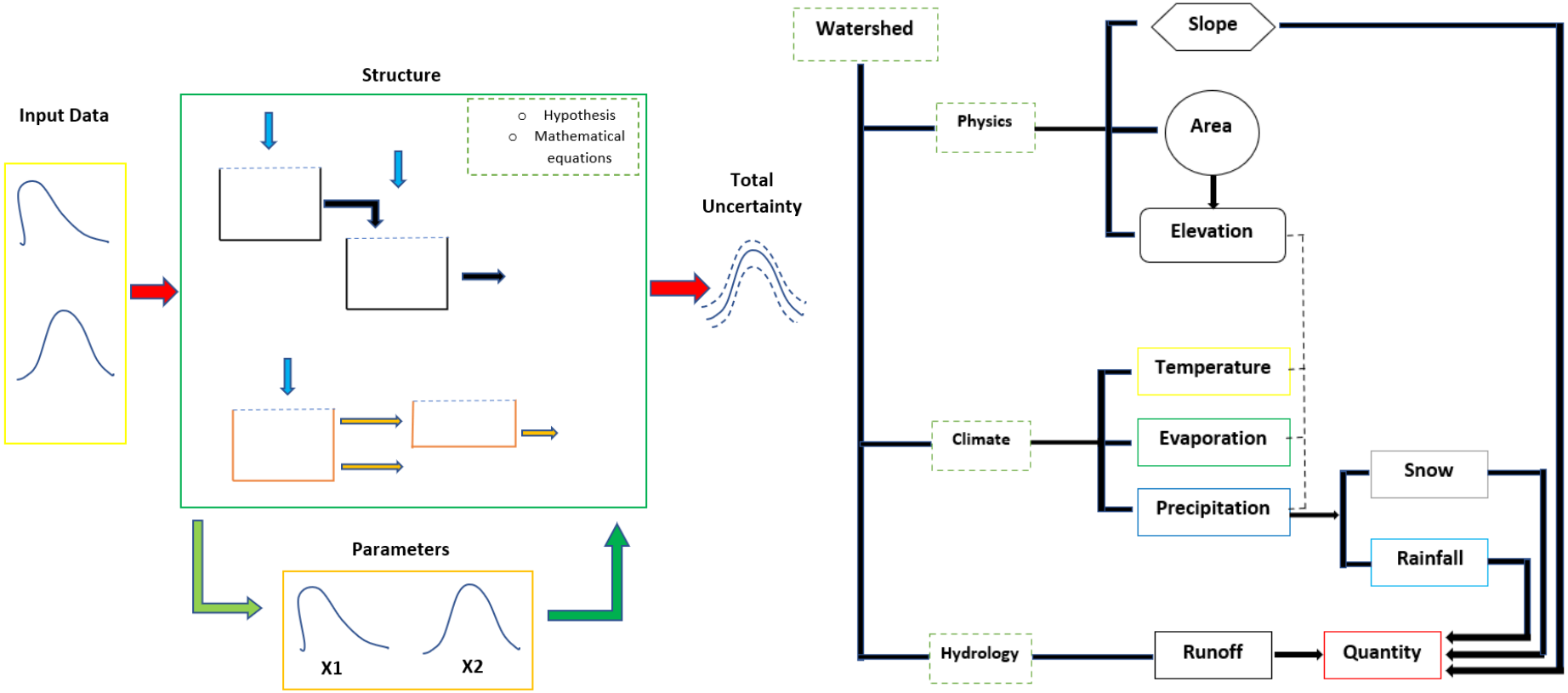
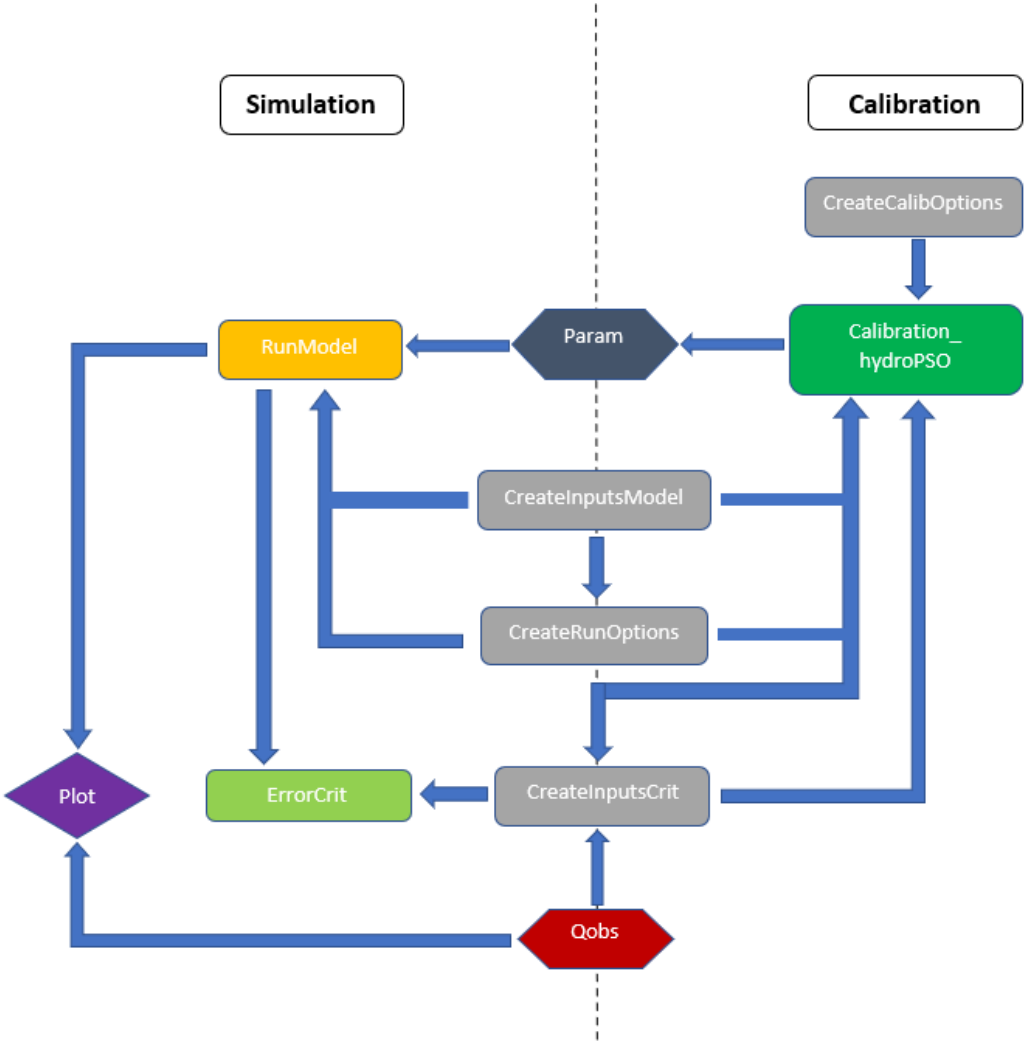
UTHBAL MODEL

Redesign of model structure



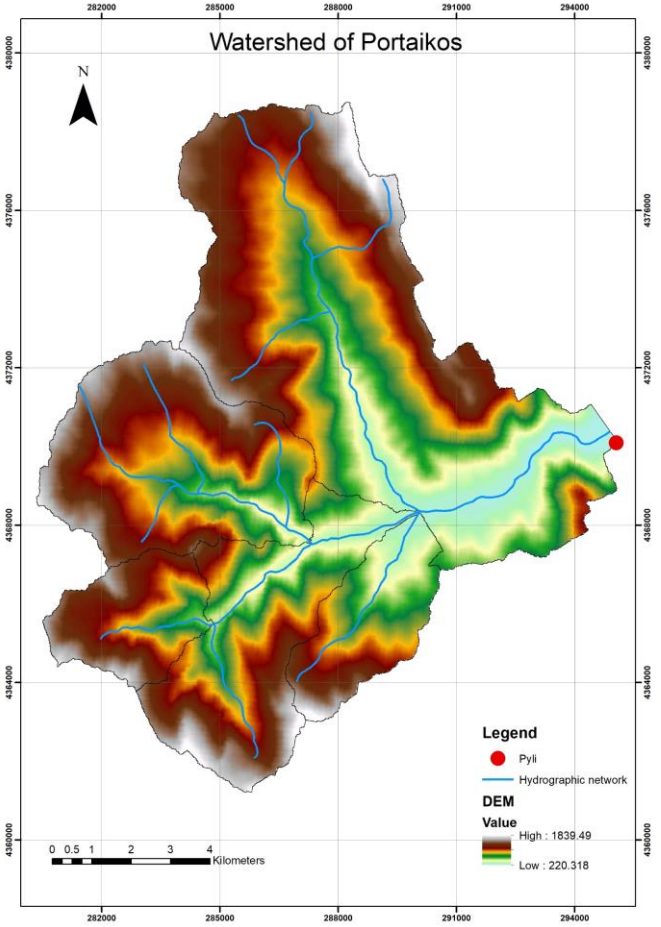
The R-UTHBAL MODEL

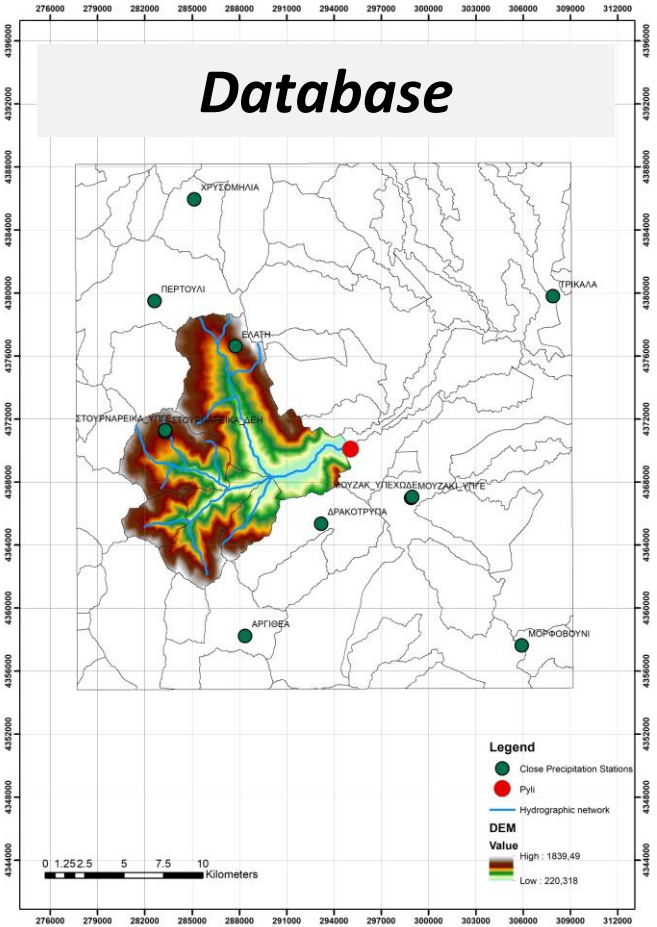
The R workflow environment with hydroPSO algorithm



APPLICATION OF THE METHODOLOGY

Portaikos river watershed, Thessaly, Greece





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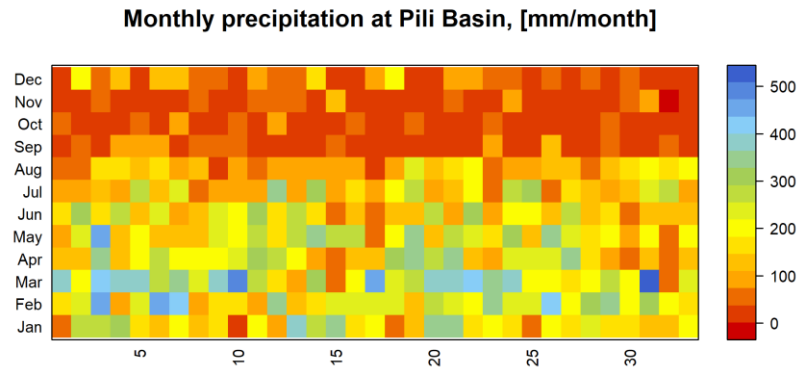
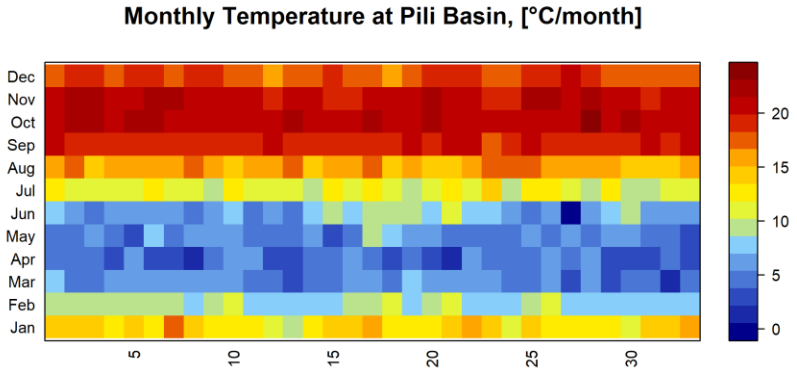
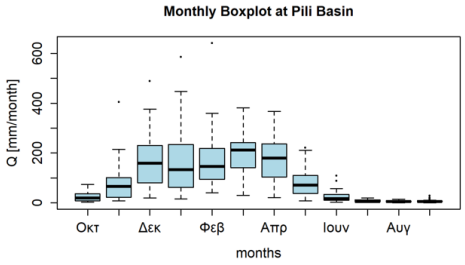
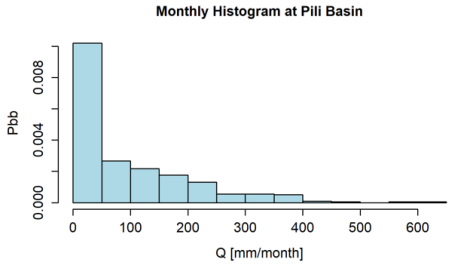
INPUT DATASETS

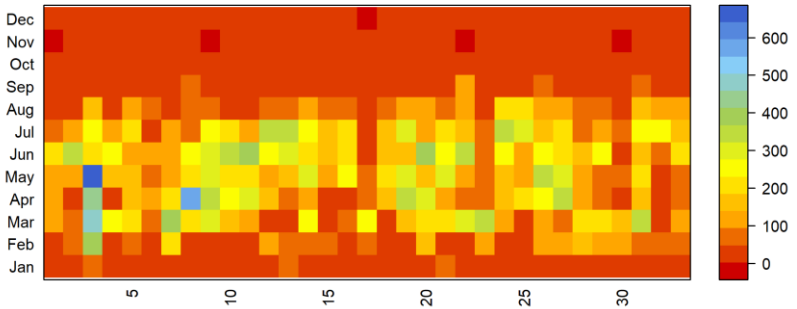
Hydrologic Period: Oct 1960 - Sep 1993

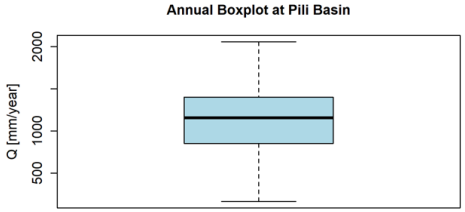


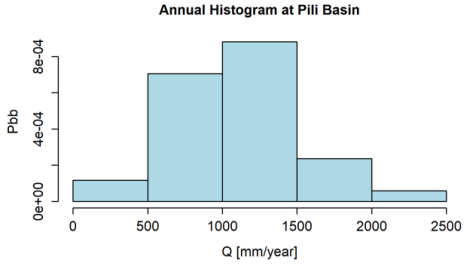












R-UTHBAL MODEL

Sensitivity Analysis Results

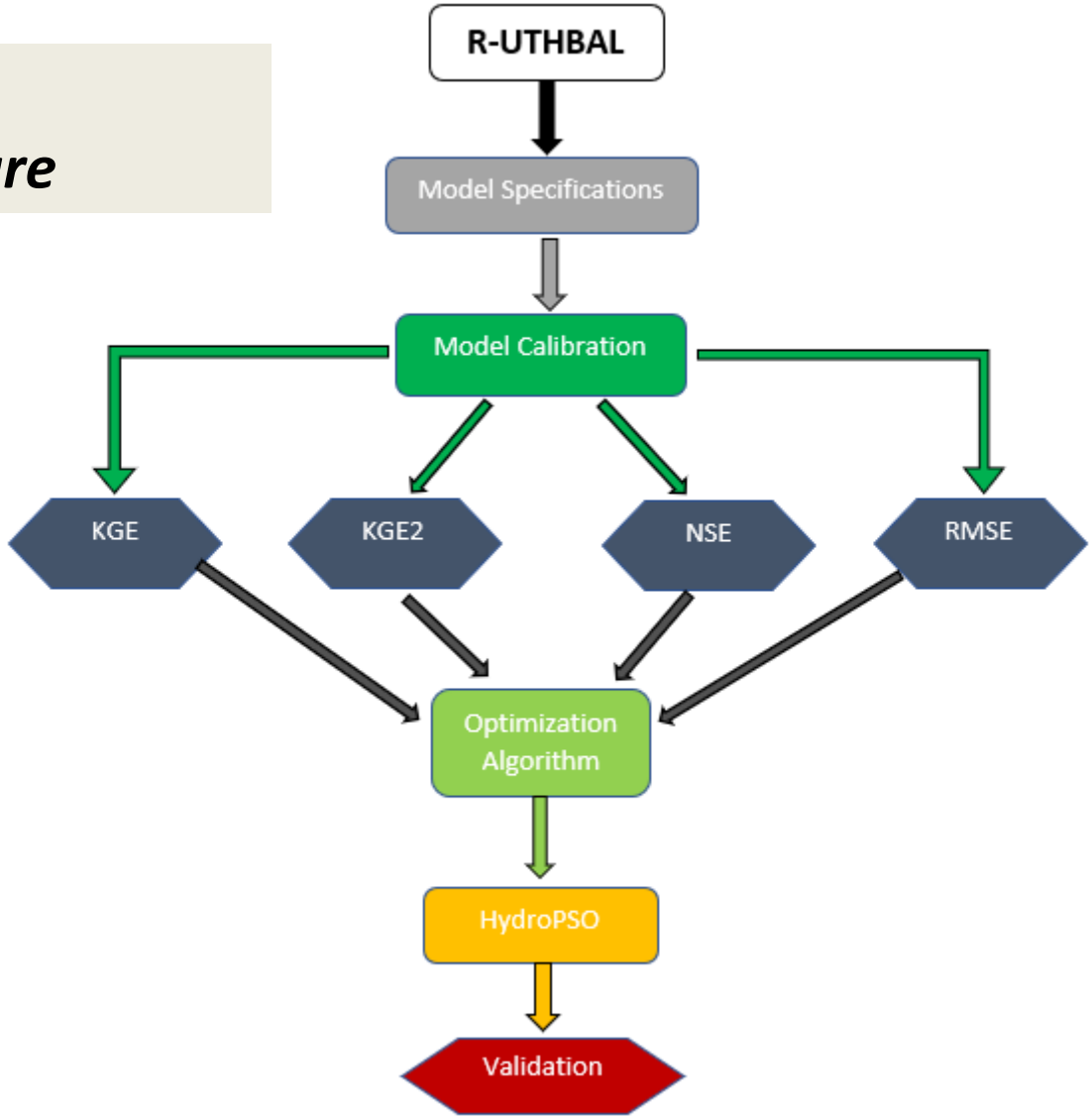
Model parameter range values, sensitivity analysis results and optimised model parameters using the R-UTHBAL model and hydroPSO algorithm

Parameter	Min Value	Max Value	*Ranking Number*	*Normalised Relative Importance (%)*	*Optimised Value 1960-1977*	*Optimised Value 1977-1993*
C_m	0	12	6	09.96	80.244	166.2
CN	30	100	5	14.47	60.300	172.9
K	0	1	4	17.16	24.810	177.3
α = aAET	0	1	3	18.70	93.055	200.0
β = CONMR	0	1	2	19.66	7.979	125.9
γ = CONGROUND	0	1	1	20.02	192.678	232.9

R-UTHBAL MODEL APPLICATION

Water Balance Modelling Procedure

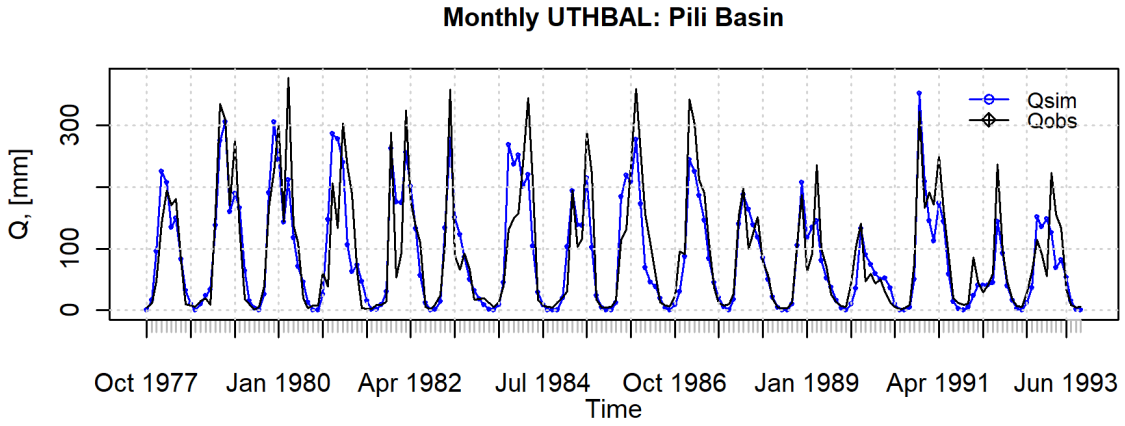
Objective Functions



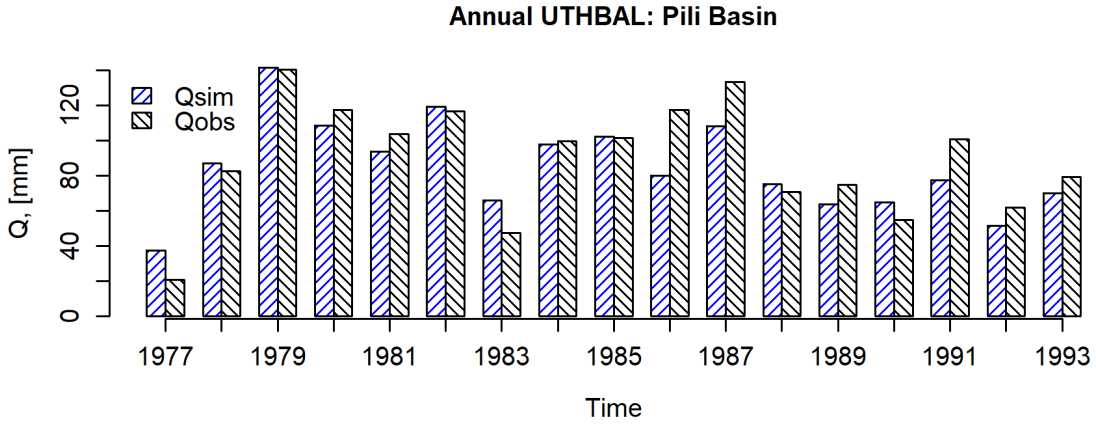
R-UTHBAL MODEL RESULTS

Validation Results:
Monthly and annual graphs using several performance indices for validation period Oct 1977 – Sep 1993

Observed and simulated streamflows



MAE = 31.89
RMSE = 47.83
NRMSE = 49.3
PBIAS = -6
RSR = 0.49
rSD = 0.9
NSE = 0.76
mNSE = 0.6
rNSE = -0.54
d = 0.93
md = 0.79
rd = 0.55
r = 0.87
R2 = 0.76
bR2 = 0.65



MAE = 11.59
RMSE = 15.1
NRMSE = 46.8
PBIAS = -5.2
RSR = 0.47
rSD = 0.82
NSE = 0.77
mNSE = 0.56
rNSE = 0.46
d = 0.93
md = 0.76
rd = 0.83
r = 0.89
R2 = 0.8
bR2 = 0.73

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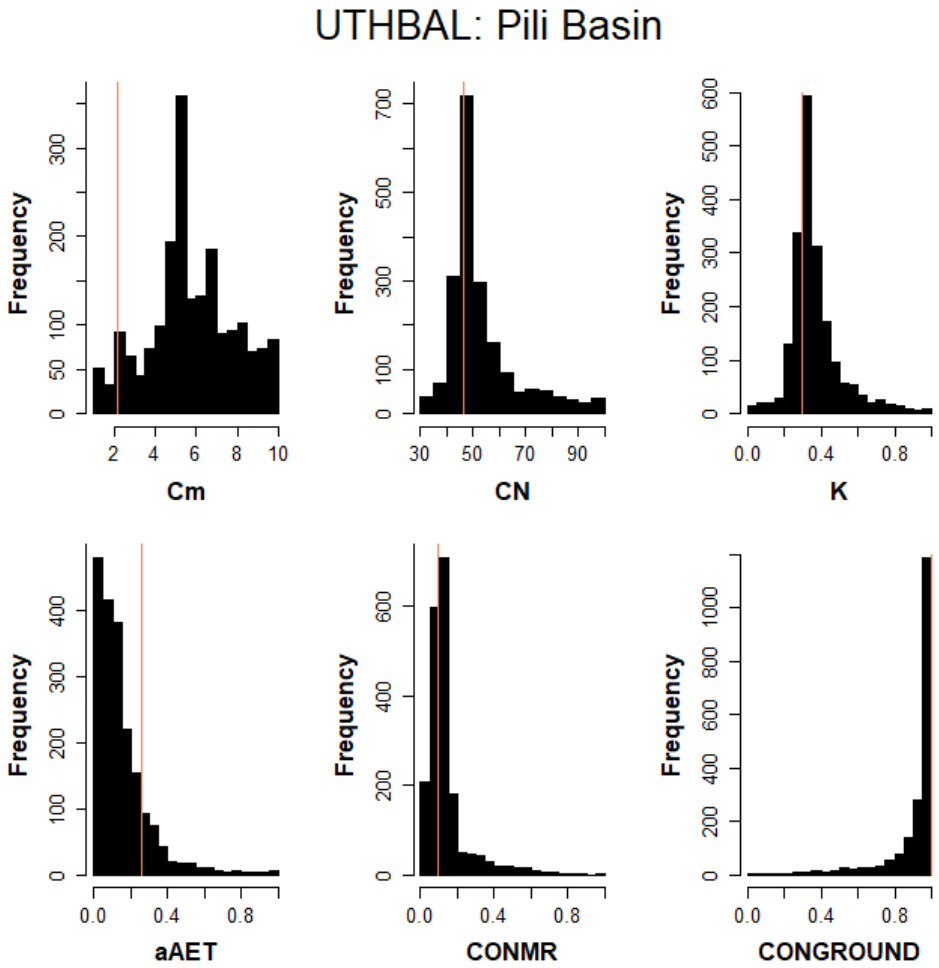
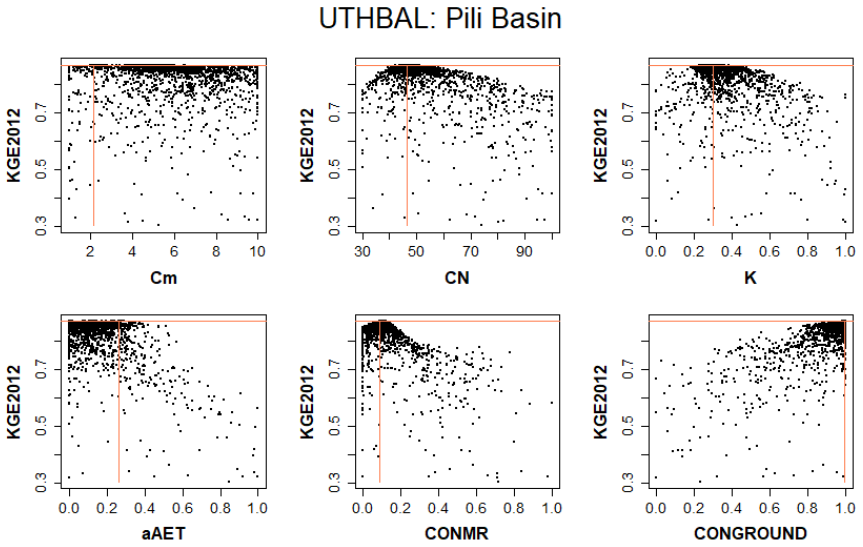
R-UTHBAL MODEL RESULTS

Model Parameter Results: Calibration Period





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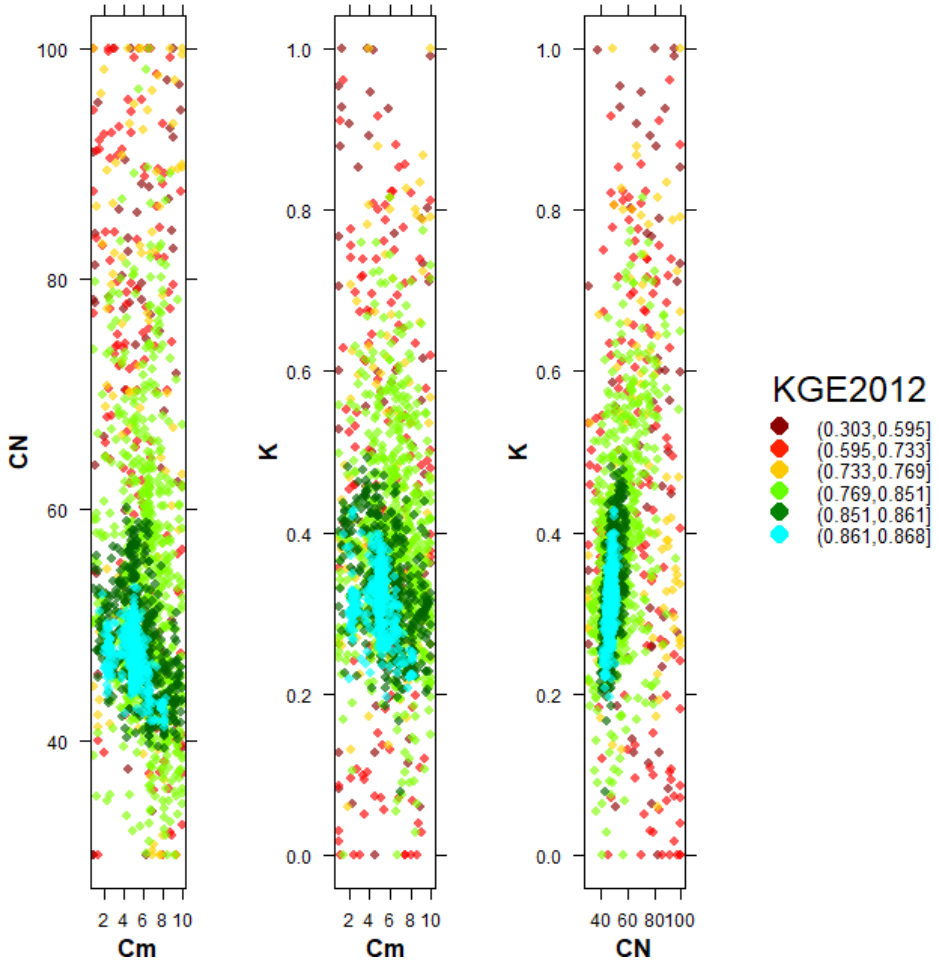

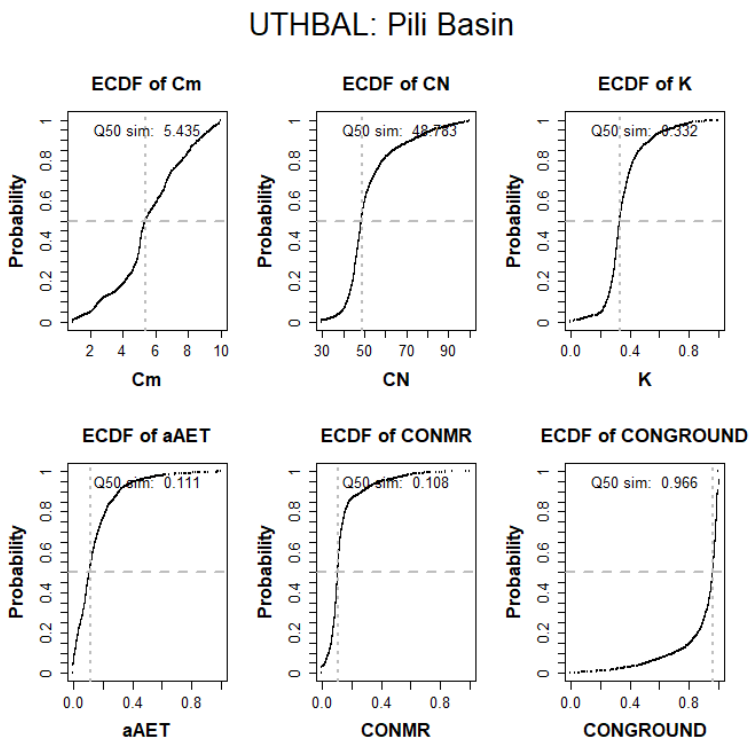

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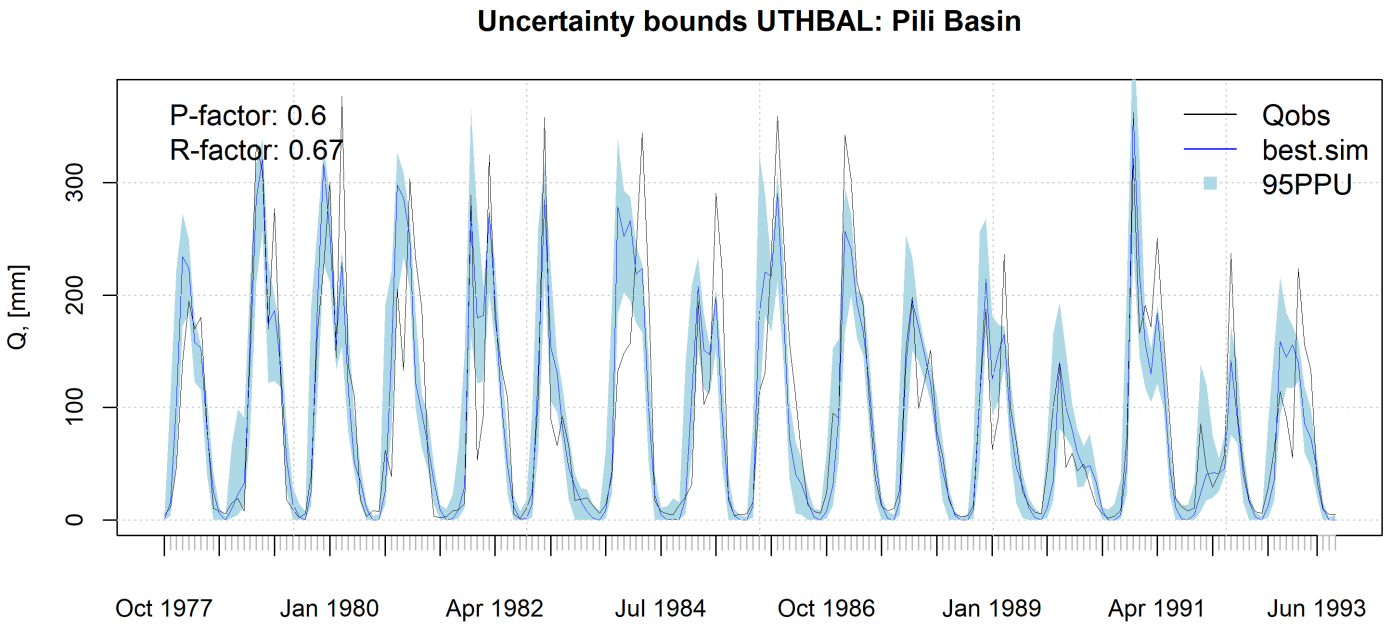
R-UTHBAL MODEL RESULTS

Uncertainty Analysis Results: Validation Period

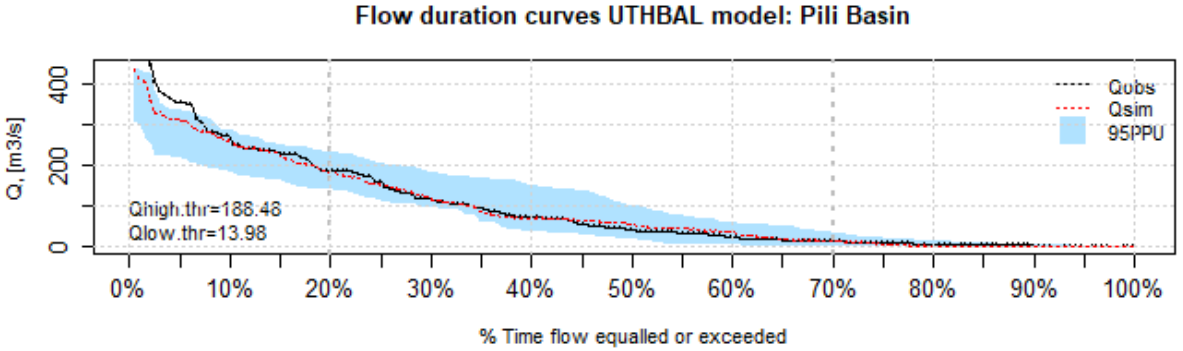
Observed and simulated streamflows

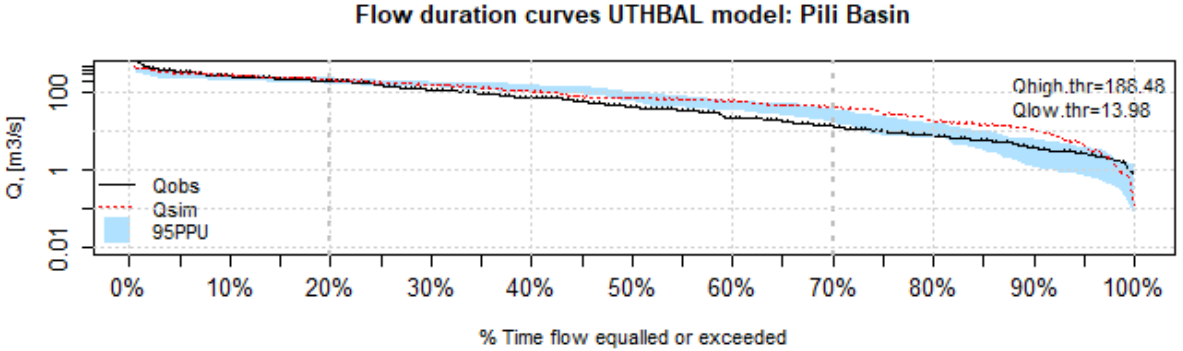


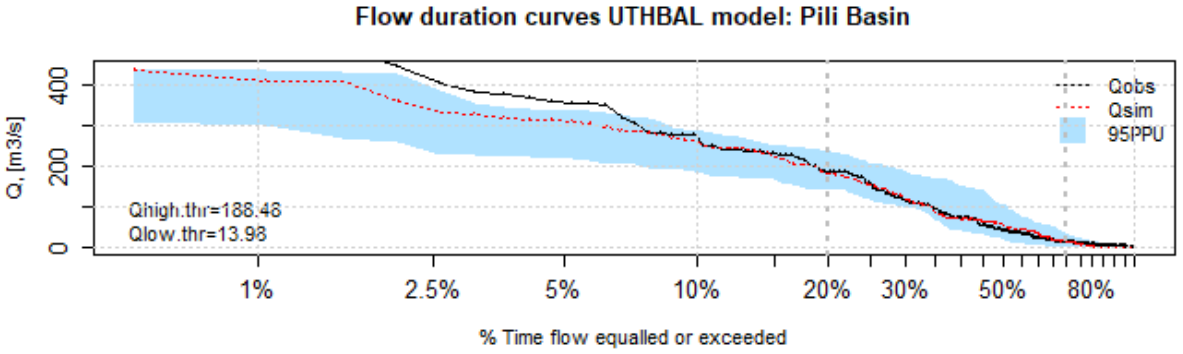
R-UTHBAL MODEL RESULTS

Uncertainty Analysis Results: Validation Period

Observed and simulated streamflows







THANK YOU FOR YOUR ATTENTION

More Info:

https://sciforum.net/paper/view/14192

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