

TABLE OF CONTENTS

1	CHAPTER 1. Introduction	13
1.1	Probabilistic uncertainty quantification	15
1.2	Predictive uncertainty	18
1.3	Performance metrics	20
1.3.1	Nash-Sutcliffe Efficiency (NSE)	20
1.3.2	Kling-Gupta Efficiency (KGE)	20
1.3.3	PQQ plot	21
1.3.4	Reliability	21
1.3.5	Precision	22
1.3.6	d-factor	22
1.3.7	Containing ratio (CR 95%)	22
1.3.8	Average band width of 95% uncertainty band (B) and deviation amplitude (D)	23
1.4	Main aims and scope	23
2	CHAPTER 2. Assessing post-processing approaches for monthly streamflow in 12 MOPEX catchments	26
2.1	Introduction	28
2.2	Methodology	31
2.2.1	Review of hydrological post-processing methods	31
2.2.2	MOPEX database	36
2.2.3	GR4J rainfall-runoff model	39
2.2.4	Verification metrics	39
2.2.5	Comparison framework	40
2.3	Results and discussion	41
2.3.1	Comparison of uncorrected and post-processed streamflow predictions	42
2.3.2	Comparison of the predictive performance of post-processing methods	44

2.4	Conclusions	51
3	CHAPTER 3. Hydrological post-processing based on approximate Bayesian computation (ABC)	54
3.1	Introduction	55
3.2	Theory and methods	57
3.2.1	Monthly streamflow post-processor	57
3.2.2	MCMC for monthly streamflow post-processor in Bayesian framework	59
3.2.3	ABC post-processor	60
3.2.4	Verification measures	63
3.3	Applications	64
3.3.1	First Scenario: The Aipe Catchment	67
3.3.2	Second Scenario: The Oria Catchment	70
3.4	Discussion and Conclusions	72
4	CHAPTER 4. Estimating the uncertainty of streamflow statistics obtained from climate projections using the ABC post-processor	75
4.1	Introduction	77
4.2	Methodology	81
4.2.1	General framework	81
4.2.2	The ABC post-processing procedure	83
4.2.3	Verification metrics	85
4.3	Case study	86
4.3.1	The catchment	86
4.3.2	Observational data and hydrological model	88
4.3.3	Climate change data	89
4.4	Results	90
4.4.1	Hydrological model evaluation	90
4.4.2	The general streamflow predictive performance of the climate models	92

4.5	Discussion and Conclusions	102
5	CHAPTER 5. Conclusions	107
5.1	Concluding remarks	109
5.2	Future research lines	111
6	List of scientific publication	111
6.1	Peer-reviewed journal publications	111
6.2	Conference contributions and publications in proceedings	112
7	References	114