POTENTIALS AND LIMITATIONS OF THE NAM MODEL IN ASSESSING FUTURE WATER AVAILABILITY IN THE VU GIA - THU BON RIVER BASIN UNDER CLIMATE CHANGE

Dang Quang Thinh[1], Patrick Laux[2], Tran Thuc[1], Johannes Cullmann[3], Harald Kunstmann[2], Huynh Thi Lan Huong[1]

Email: dqthinh@imh.ac.vn; Patrick.laux@kit.edu; tranthuc.vkttv@gmail.com; cullmann@bafg.de; harald.kunstmann@kit.edu; huynhlanhuong@gmail.com

1 Vietnam Institute of Meteorology, Hydrology and Environment, Hanoi, Vietnam

2 Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research IMK-IFU, 82467 Garmisch-Partenkirchen, Germany

3 IHP/HWRP Secretariat, Federal Institute of Hydrology, 56068 Koblenz, Germany

Introduction

The ability to accurately assess and predict future water availability in a country or in one particular region is vital in planning and implementing its water resources development activities. Hydrological modeling is one of traditional and robust approaches for projecting river flow. This study aims at investigating the capability of NAM model (MIKE Zero package developed by DHI) in the simulation of rainfall-runoff process in VuGia-ThuBon basin in centre of Vietnam.

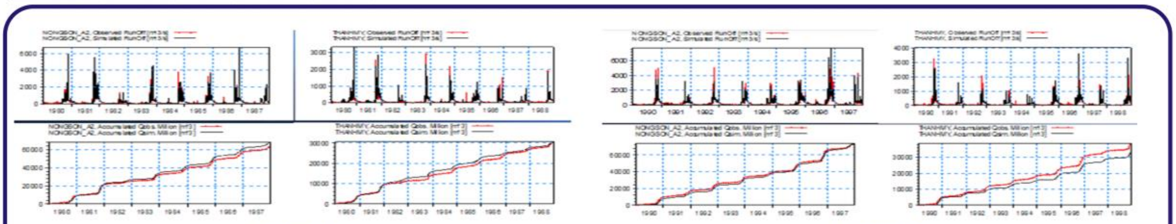
Fig 1: Study area and location of gauging stations

Table 1: Nash-Sutcliffe is used to test the goodness of fit of simulated and observed flows

Rainfall data	Nong Son		Thanh My	
	Calibration	Validation	Calibration	Validation
Ground station rainfall	0.90	0.88	0.87	0.86
Grid rainfall D03 (5 km)	0.82	0.75	0.79	0.65
Grid rainfall D02 (15km)	0.78	0.69	0.53	-0.59

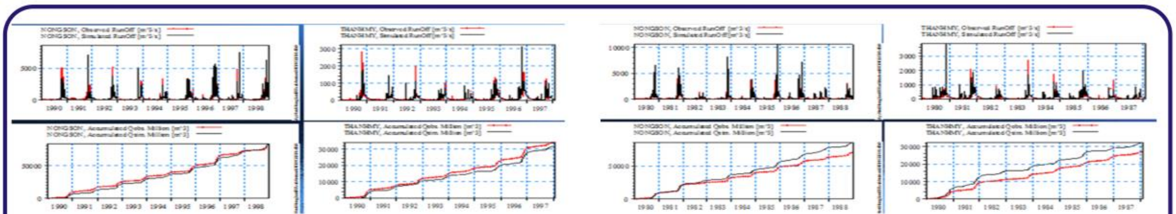
Method and tool

NAM (Mike 11) model is calibrated against daily observed discharges using both manual calibration and auto-calibration. Model calibration and validation is conducted using daily ground station rainfall and grid rainfall generated from WRF simulations forced by ECHAM5 and the A1B and B1 SRES scenarios using a nested approach. Sensitivity analysis of the key model parameters is also performed to test the response of the basin to its generated runoff.



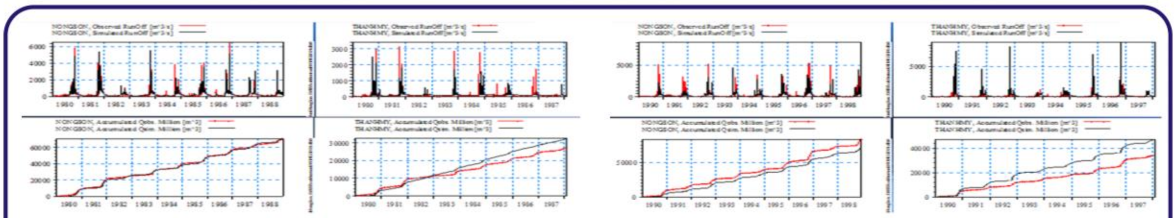
Calibration Validation

Fig 2: Results of model calibration and validation using ground rainfall data



Calibration Validation

Fig 3: Results of model calibration and validation using grid rainfall data (D03, 5km)



Calibration Validation

Fig 4: Results of model calibration and validation using grid rainfall data (D02, 15km)

Nong Son

Parameter	L_{max}	U_{max}	CQOF	CKIF	CKBF	$CK_{1,2}$	TOF	TIF	TG
Value	200	15	0.494	374.1	1000	25.1	0.678	0.0322	5.30E-05
NASH	0.883	0.883	0.883	0.883	0.883	0.883	0.883	0.883	0.883
Increase the value by 5%	210	15.75	0.5187	392.805	1050	26.355	0.7119	0.03381	0.00005565
NASH	0.883	0.884	0.893	0.884	0.883	0.884	0.883	0.883	0.883
Increase the value by 10%	220	16.5	0.5434	411.51	1100	27.61	0.7458	0.03542	0.0000583
NASH	0.882	0.884	0.897	0.884	0.883	0.883	0.883	0.883	0.883

Thanh My

Parameter	L_{max}	U_{max}	CQOF	CKIF	CKBF	$CK_{1,2}$	TOF	TIF	TG
Value	82	10.4	0.404	200	1191	17.5	0.8	6.68E-05	4.10E-06
NASH	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857
Increase the value by 5%	86.1	10.92	0.4242	210		18.375	0.84		4.305E-06
NASH	0.857	0.858	0.859	0.857	0.857	0.857	0.857	0.857	0.857
Increase the value by 10%	90.2	11.44	0.4444	220	1310.1	19.25	0.88		
NASH	0.856	0.858	0.858	0.857	0.857	0.856	0.857	0.857	0.857

NAM model works well with ground station rainfall data, relatively well with d3 grid rainfall but quite poorly with d2 grid rainfall data.

Calibrated NAM model can be applied to simulate water availability using ground station rainfall data and grid rainfall data after appropriate bias correction.