H08 model

TMD@IMPAC-T WS

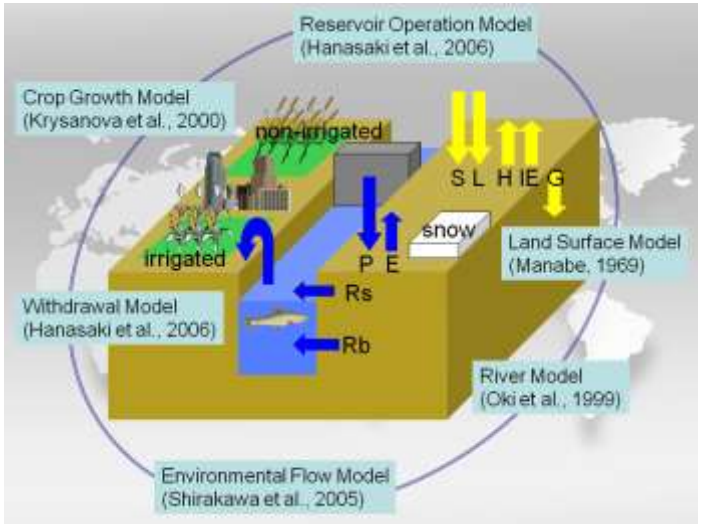
28 Jan 2013

Outline

- IMPAC-T Team & Activity
- Previous status of H08
- Current status of H08
- Future works

H08 model

- **Water resources model called “H08”**
  - Natural water cycle
  - Major human activities
    - Irrigation
    - Reservoir (dam) operation
  - Open source software (free!)
  - Originally, global model
  - Chao Phraya River Basin for IMPAC-T



Hanasaki et al. 2008

Members of H08 Team

Adisorn Champathong (RID)

Jaray Thongduang (RID)

Santi Sumdin (TMD)

Chatchai Chaiyasaen (TMD)

Somkid Saphaokham (RID)

Thada Sukhapunaphan (RID)

Naota Hanasaki (NIES)

Chaiwat Ekkawatpanit (KMUTT, PI)

Activity of H08 Team (1/3)

H08 lecture 1
Dec. 20 - 24, 2010
Kasetsart Univ., Bangkok

H08 lecture 2
Aug. 1-4, 2011
Kasetsart Univ., Bangkok

H08 lecture 3
Oct. 3-7, 2011
NIES, Tsukuba.

Activity of H08 Team (2/3)

H08 meeting
Nov. 29, 2011
JICA, Bangkok

H08 lecture 4
July. 9-12, 2012
Kasetsart Univ., Bangkok

H08 field survey in Thailand
Aug. 6-8, 2012
Sirikit dam, Khwaenoi dam, Mae Yom Weir, etc

Activity of H08 Team (3/3)

H08 field survey in Japan
Dec.15-22, 2012
Tokyo, Japan

Paper

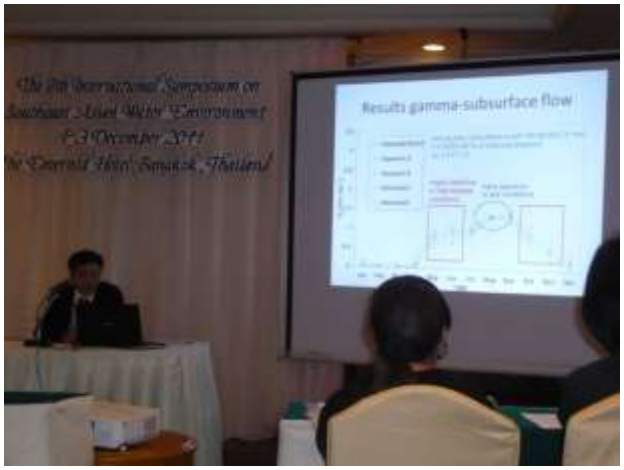
1. The 1st EIT International Conference on Water Resources Engineering @Cha-am, Petchaburi, Thailand (18-19 Aug 2011)

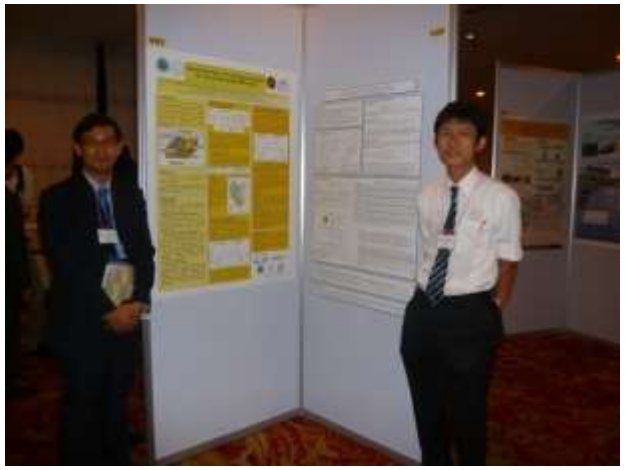
- "EVALUATION OF GSWP2 GLOBAL METEOROLOGICAL DATASET AND H08 HYDROLOGICAL SIMULATION IN THE UPPER CHAOPHAYA RIVER "
- "ASSESSMENT OF RICE YIELDS IN THE UPPER CHAO PHRAYA RIVER BASIN USING H08 MODEL"

Paper

2. The 9th International Symposium on Southeast Asian Water Environment @Bangkok, Thailand (1-3 Dec 2011)

- "Sensitivity analysis of Land Surface Parameters Using H08 Model"
- "Sensitivity Tests of Cropping parameters for Rice Yields Using H08 Model" (Poster)





Paper

3. AOGS 2012@Singapore (13-16 Aug 2012)

– "Climate change projections of river discharge for the Upper Chao Phraya River Basin"

4. Workshop on Climate Change Adaptation in the Asia-Pacific: Observations and Modeling Tools for Better Planning @Singapore (16-17 Aug 2012)

-"Introduction of H08 a Water Resources Model and Application"

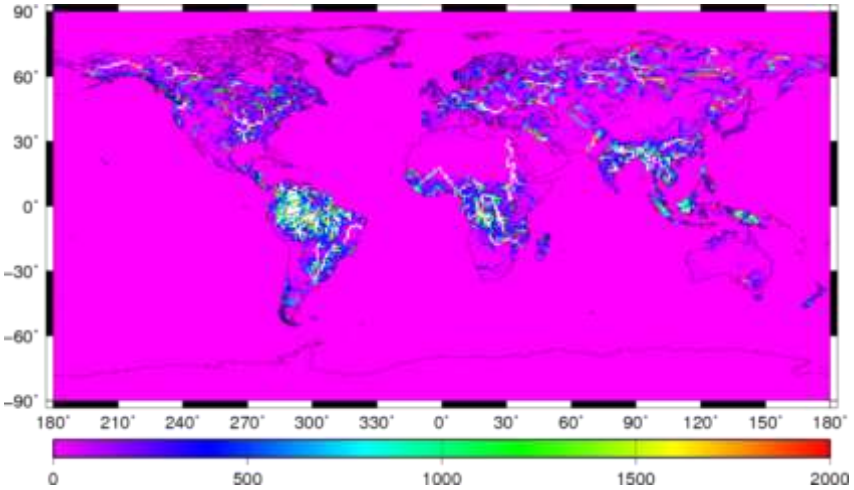
2012/ISTWG/WKSP/010

Introduction of H08 a Water Resources Model and Application

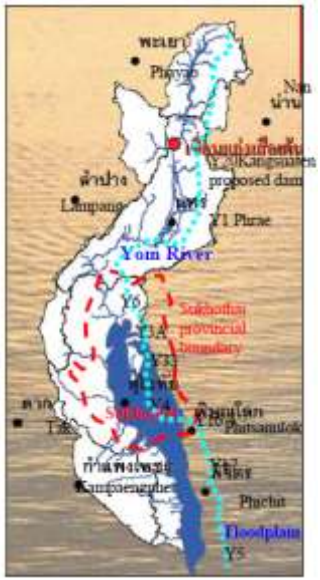
Submitted by: King Mongkut's University of Technology Thonburi (KMUTT)

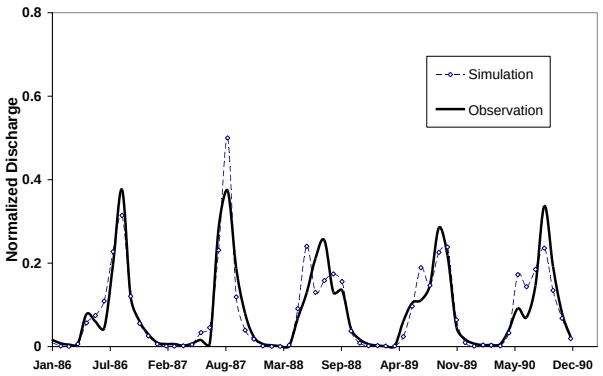
Past status of H08

Global simulation using GSWP-2

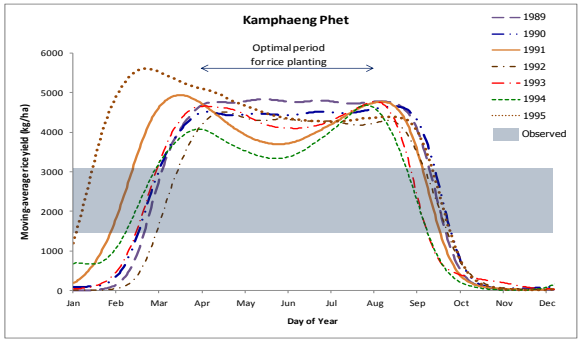


Annual river discharge in 1986





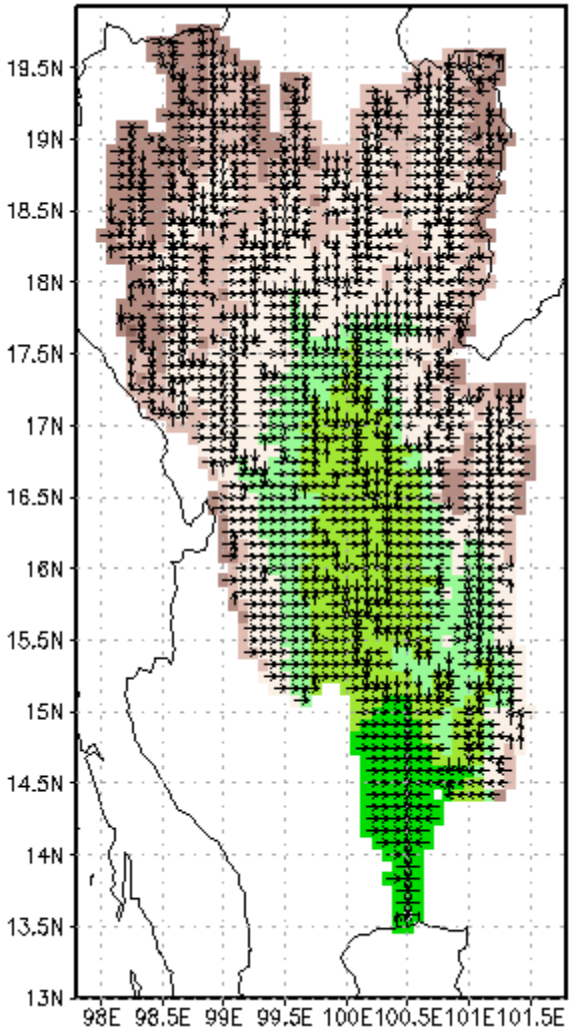
Y.6 River discharge (1986-1990)



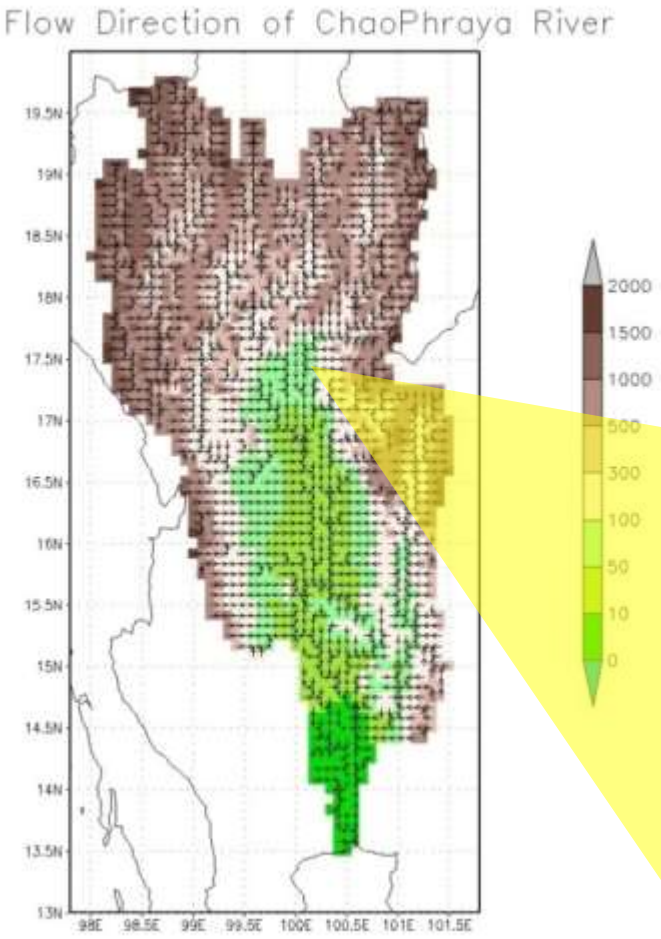
KPP. Crop yield (1989-1995)

Current status of H08

- Latest version released on Jan 1
  - Source code and manual
  - Support 5 min Chao Phraya
- Meteorological Data
  - K10 (Kotsuki et al., 2010; Kyoto Univ.)
  - 1981-2004, hourly to daily, 1936 grids
- Geographical Data
  - Flow direction, population, crop type, cropland area, irrigated area

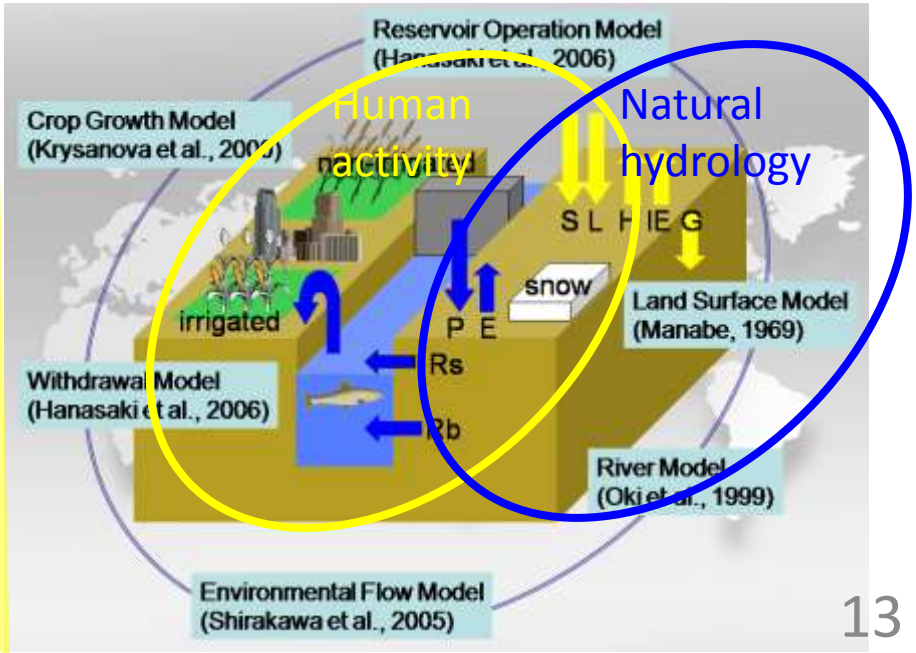


Model development



- H08 model

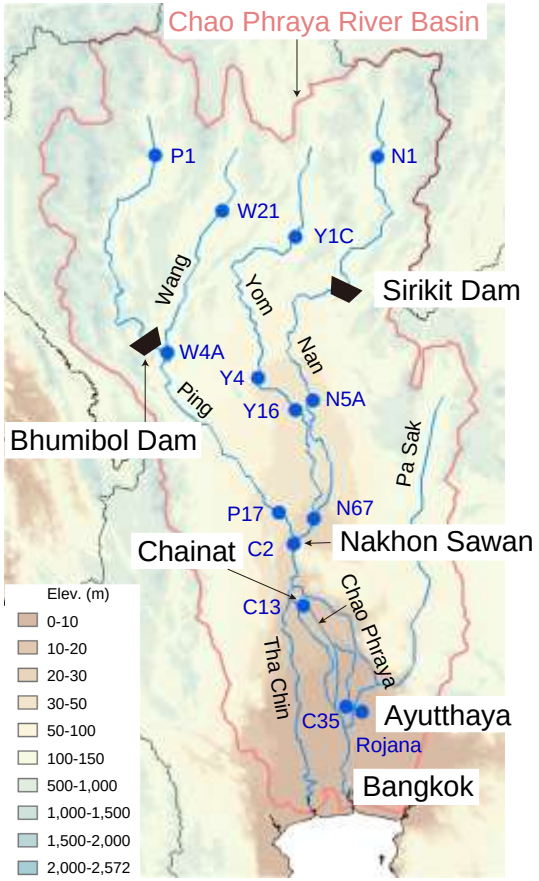
1. Simulate both natural water cycle and human water activities at daily basis
2. Open source software



Hanasaki et al., 2006, J. of Hydrol.
Hanasaki et al. ,2008a,b, Hydrol. Earth Sys. Sci.
Hanasaki et al., 2010, J. of Hydrol

Modeling reservoir operations

- In this study, we focused on Bhumibol and Sirikit Reservoirs only.
- In reality, reservoir operations are very complex
- We propose an idealized simple reservoir model.
- Although simple, this simulation offers good insight into river management and planning.



Modeling Bhumibol Reservoir

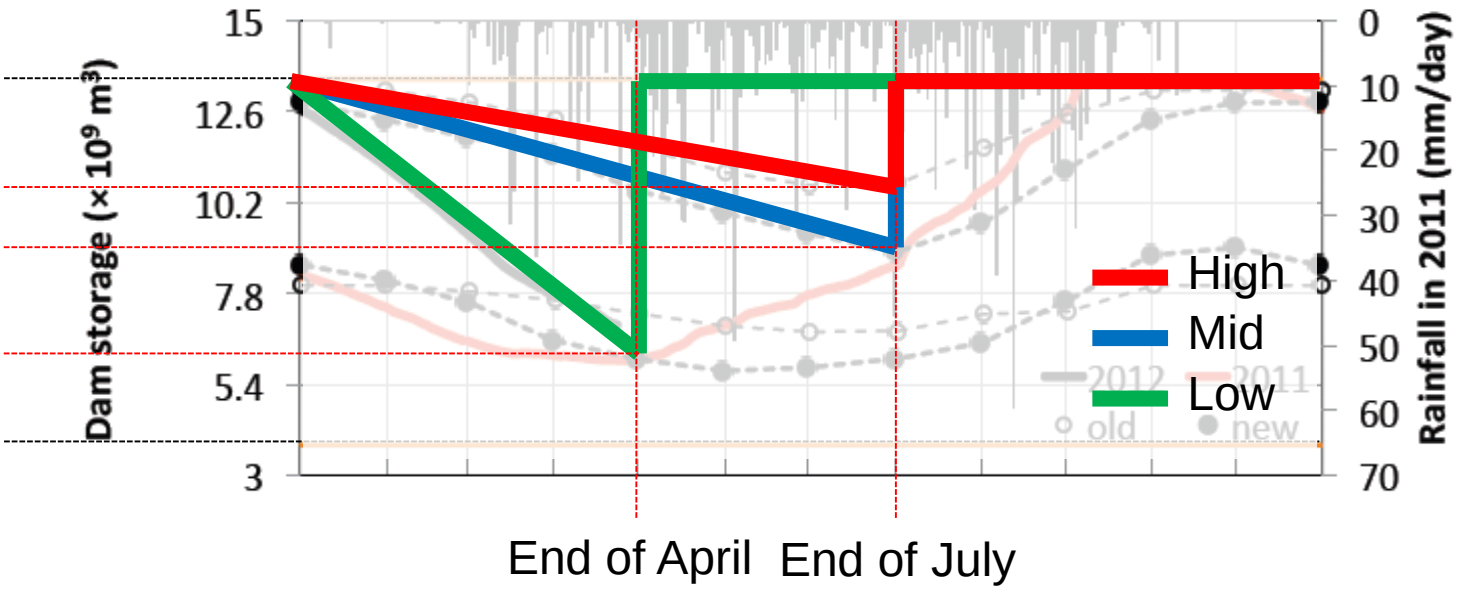
High water level
13.462x10^{9}m^3 (100%)

Old upper curve
10.8x10^{9}m^3 (80%)

New upper curve
9.0x10^{9}m^3 (67%)

2012 Upper curve
6.0x10^{9}m^3 (45%)

Minimum storage
3.8x10^{9}m^3 (28%)



Modeling Sirikit Reservoir

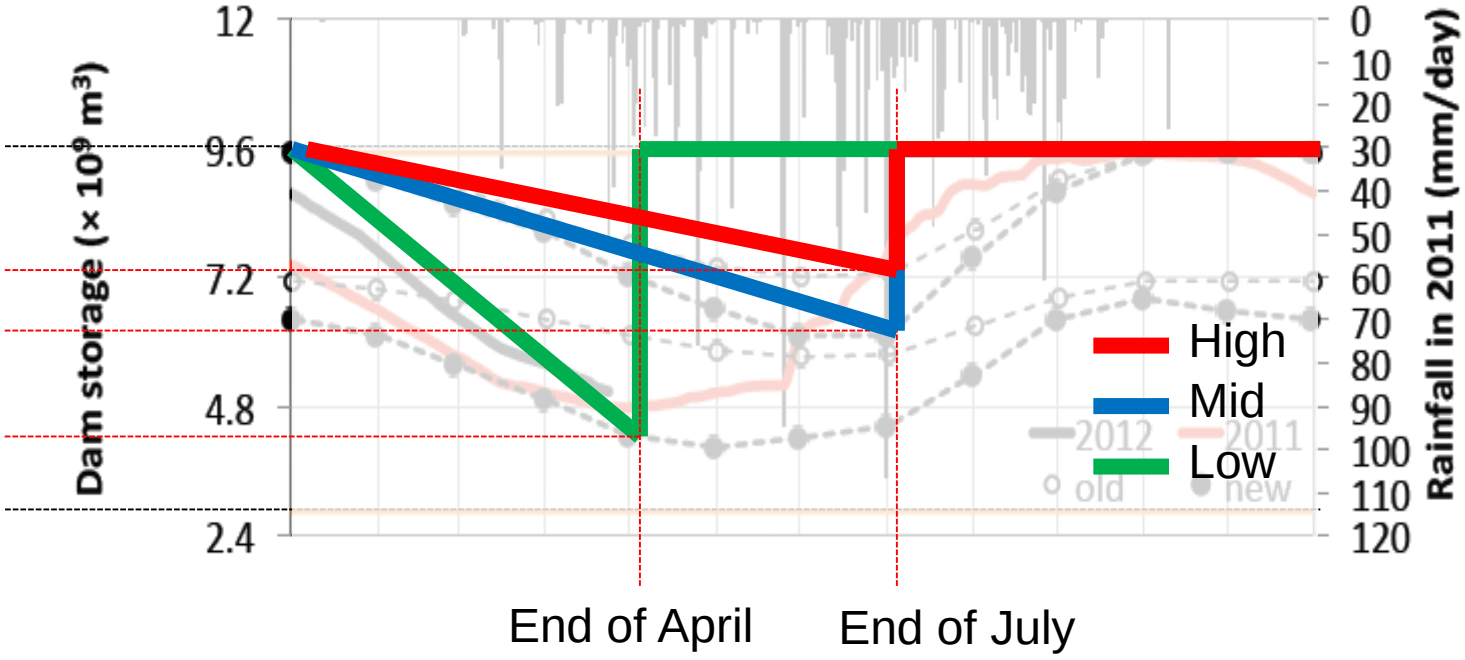
High water level
9.510x10^{9}m^3 (100%)

Old upper curve
7.2x10^{9}m^3 (75%)

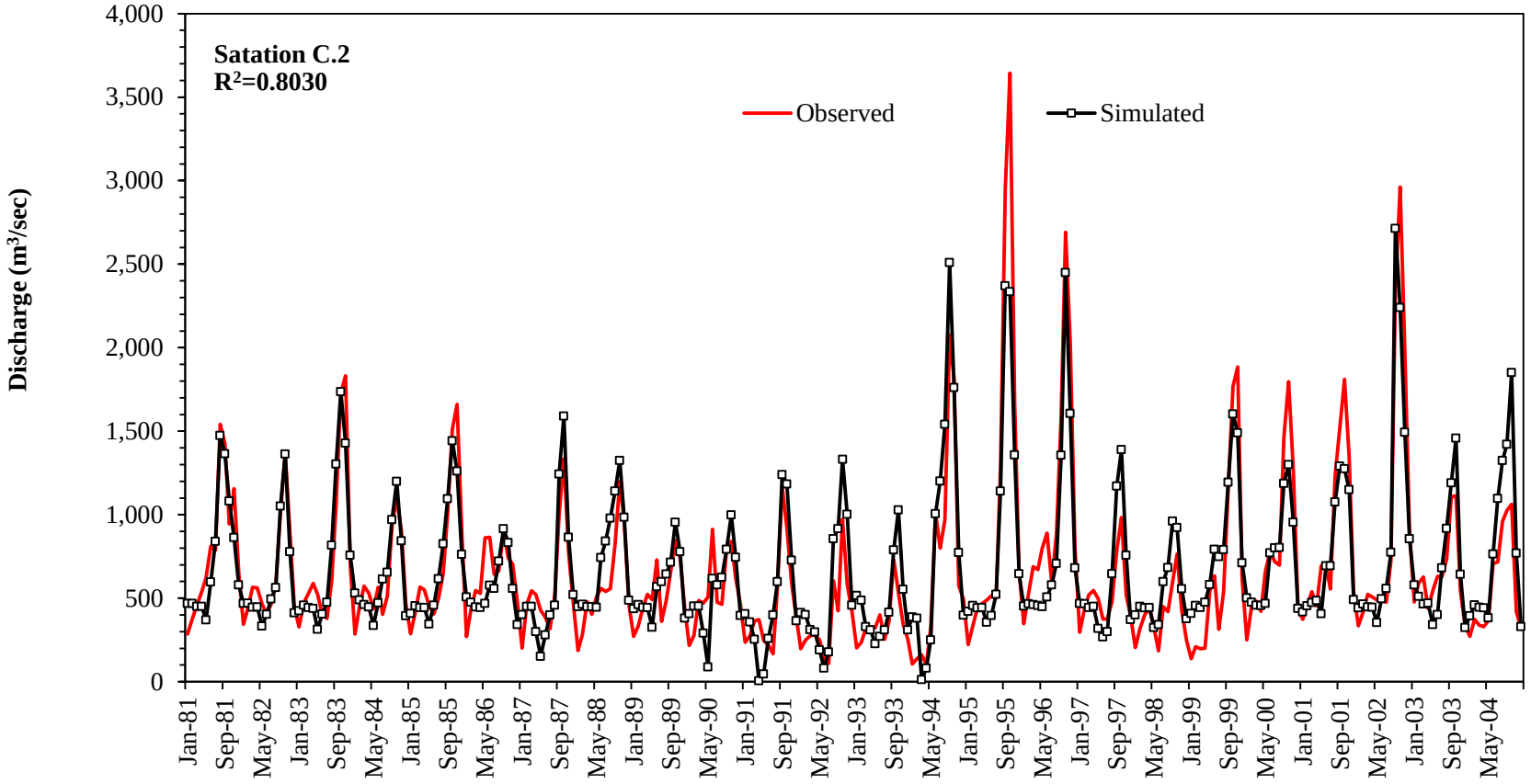
New upper curve
6.2x10^{9}m^3 (65%)

2012 upper curve
4.3x10^{9}m^3 (45%)

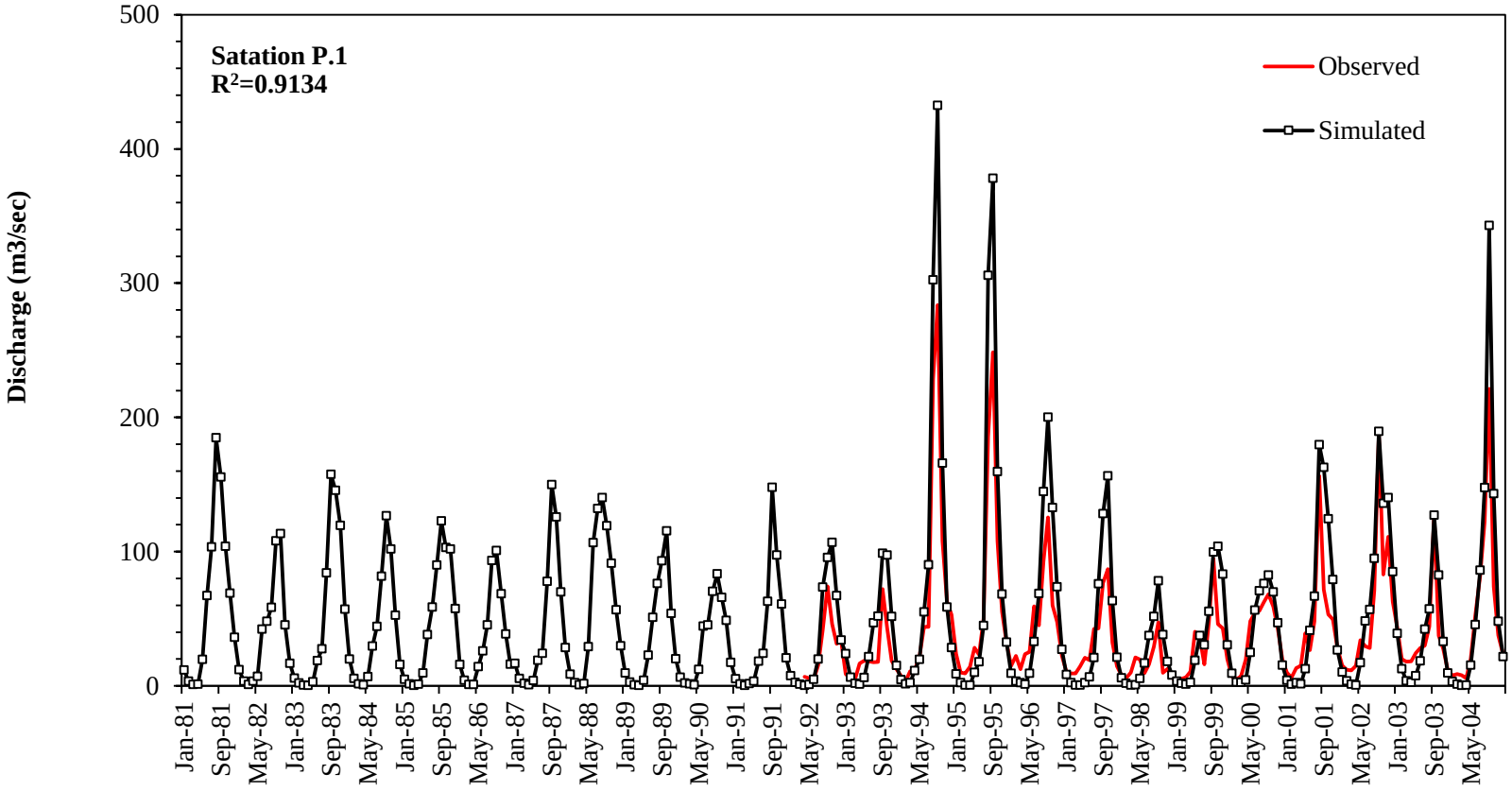
Minimum storage
2.850x10^{9}m^3 (30%)



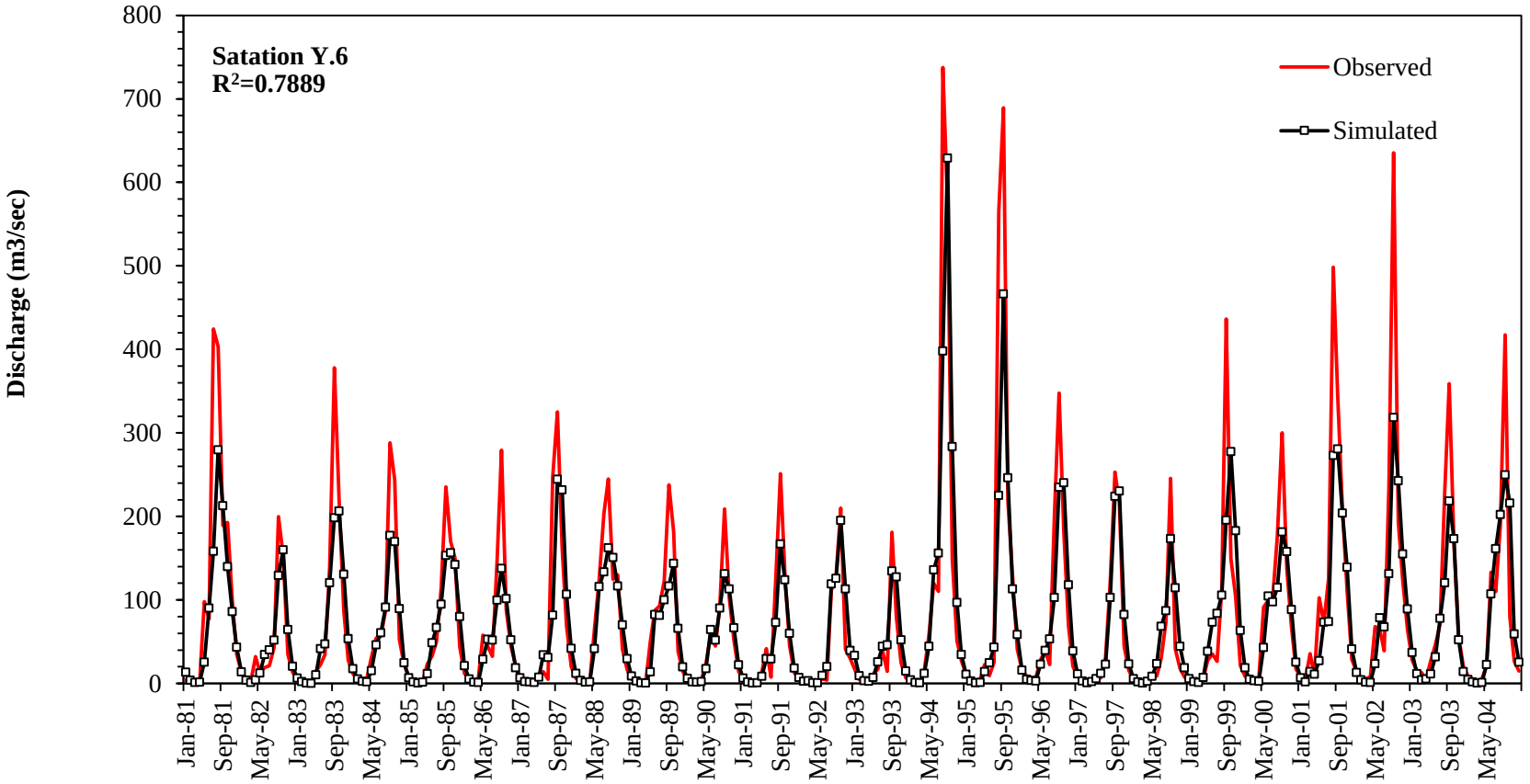
Calibration result in C.2



Calibration result in P.1



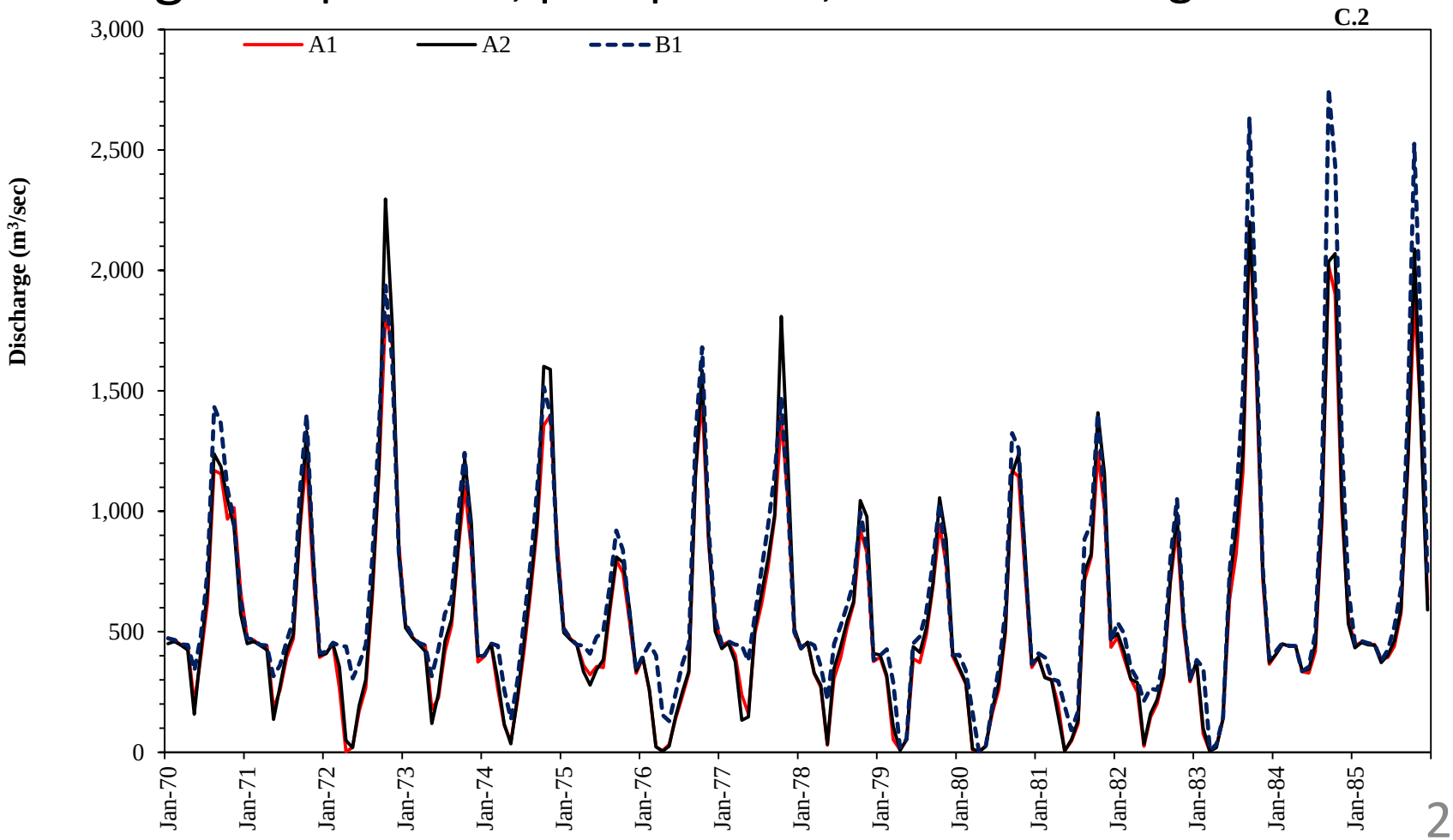
Calibration result in Y.6



Impact of Climate Change

MIROC-CMIP3 (2070-2099)

Change temperature, precipitation, downward longwave radiation



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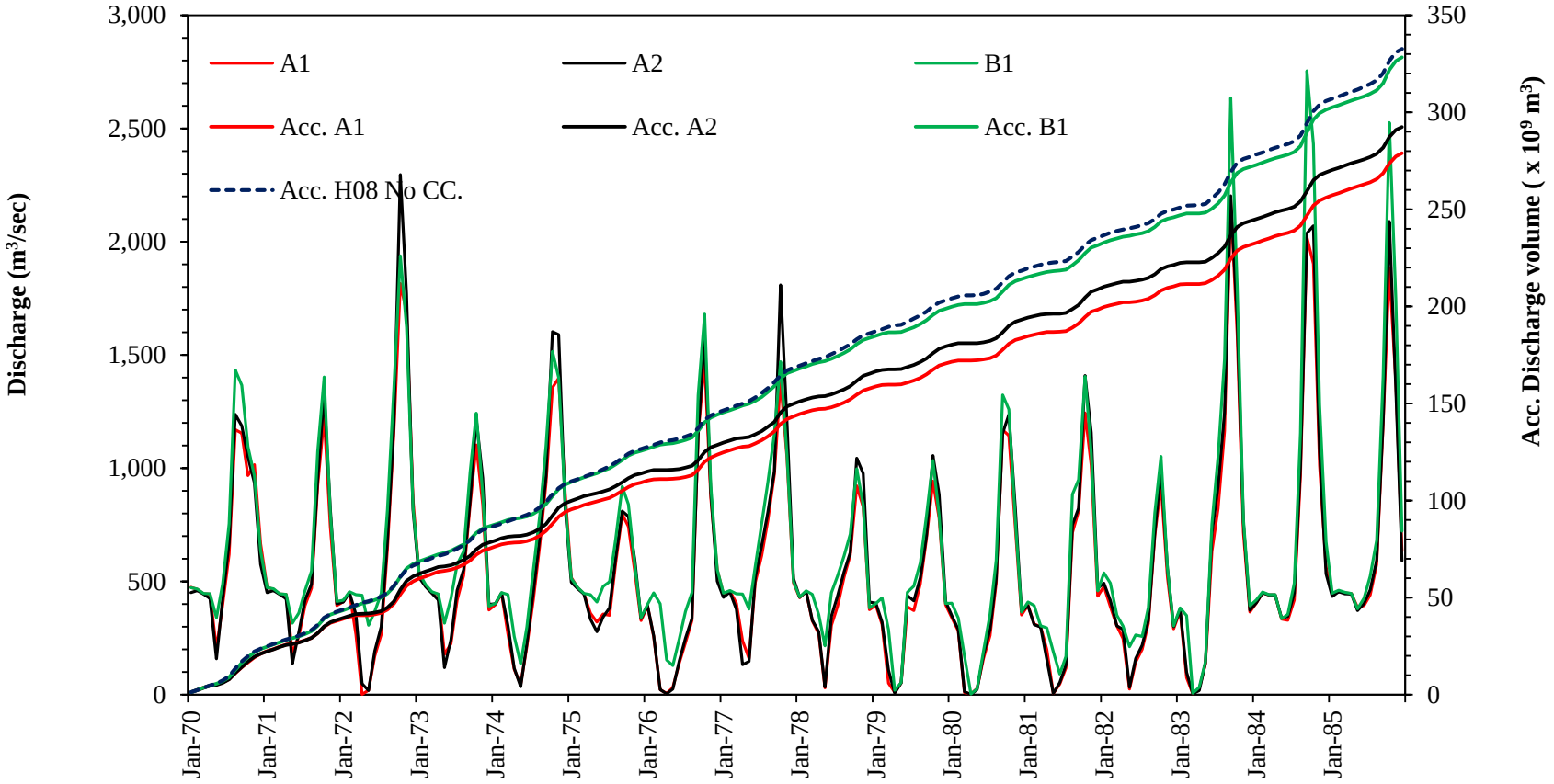

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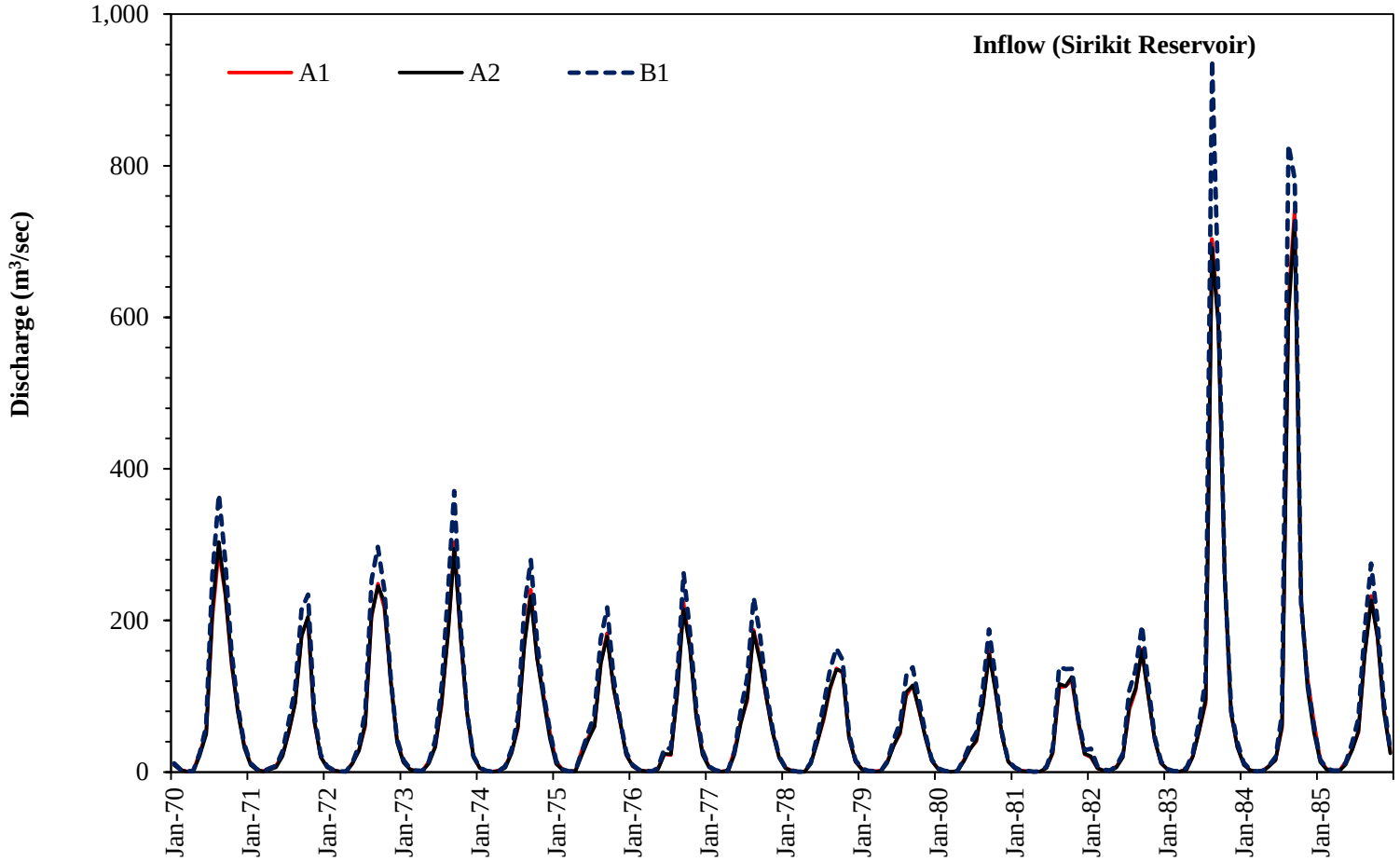
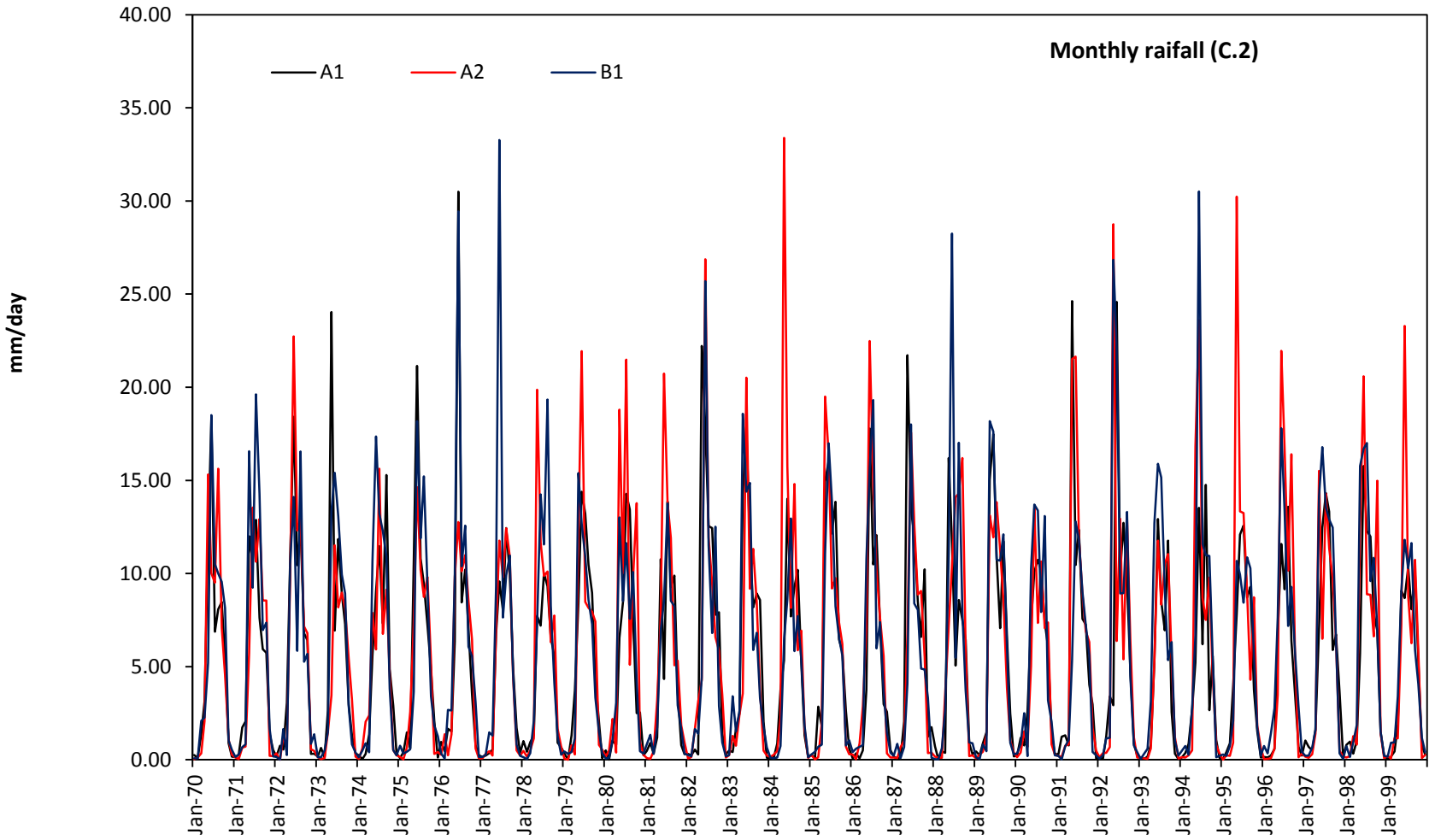


Rainfall MIROC-CMIP3 (2070-2099)



Future works

- Evaluate impact of climate change using CMIP5
- Simulate all 6 module of H08 with real cropping pattern (Dr.Preesan, GISTDA)

- Submit paper in The 2nd EIT International Conference on Water Resources Engineering, Thailand

Thank you for your kind attention.