Hydrological Model Calibration Strategy for Climate Change Impacts Study

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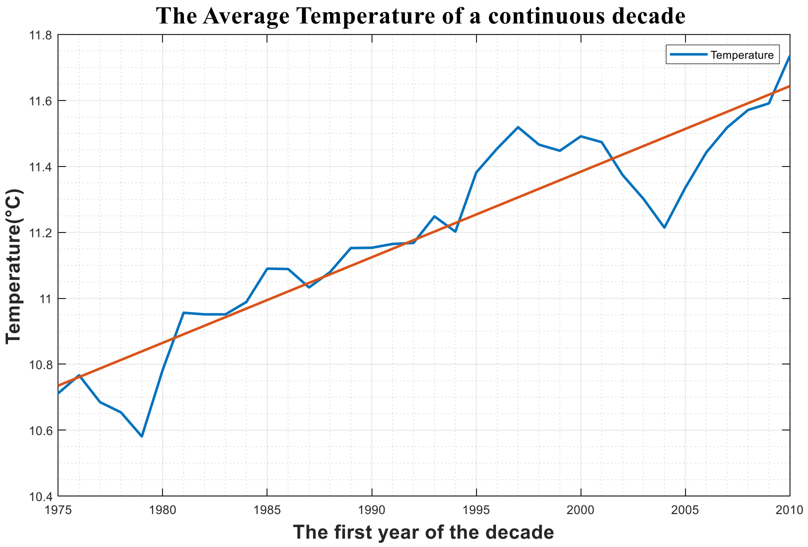
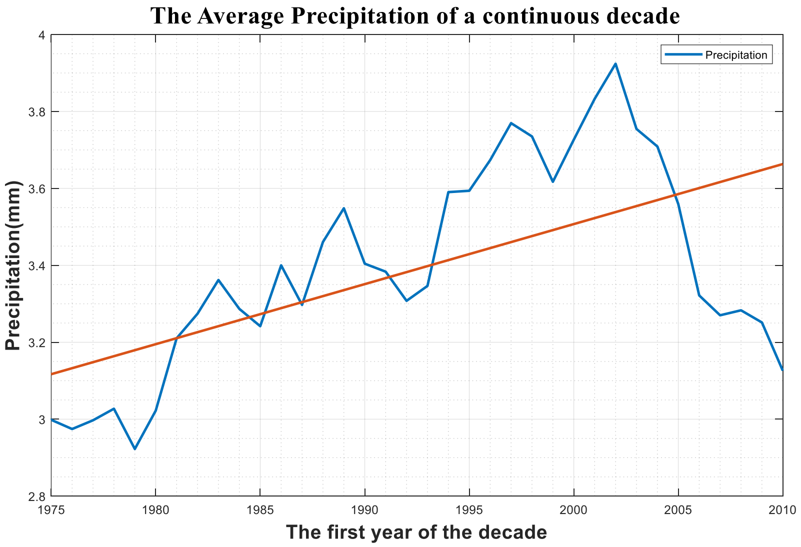
CONTENTS

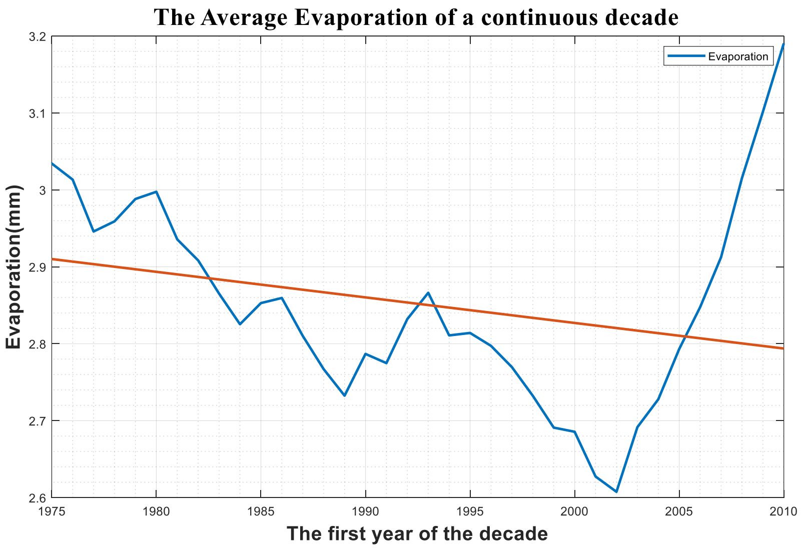
INTRODUCTION

***Hydrological Model Calibration Strategy** for Climate Change Impacts Study*

- Hydrological models require calibration to provide accurate simulation, and it usually often requires long-term historical hydrometeorological data.
- The calibrated parameters obtained from data are assumed to be stationary. However, it may not be appropriate for the changing future climate.
- This study aims to explore alternative strategies to improve model robustness for climate change impact studies







OBSERVATORY & DATA INFORMATION

***Hydrological Model Calibration Strategy** for Climate Change Impacts Study*

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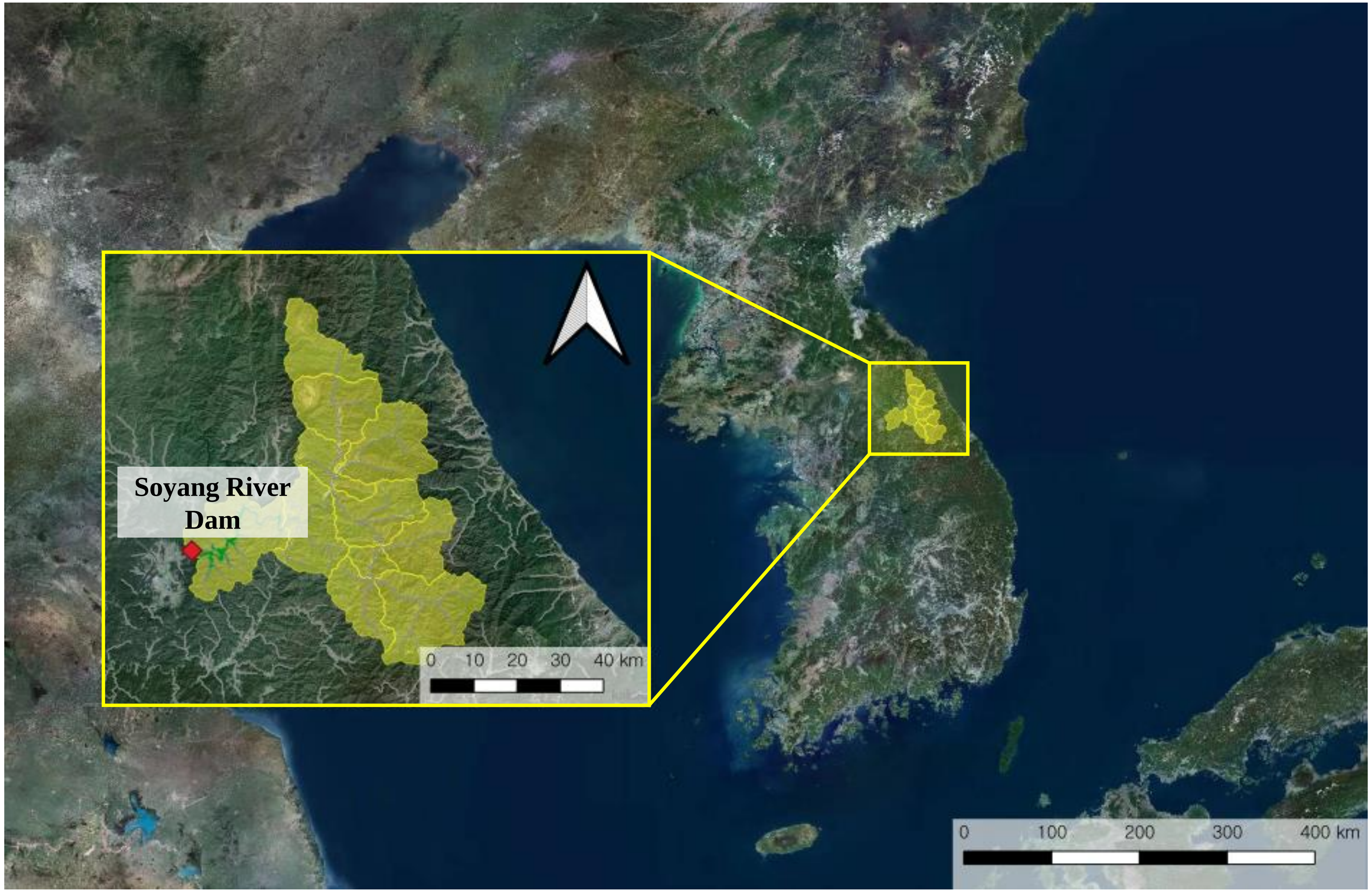
Soyang River Dam Basin in South Korea



- Basin Area: 2703 km^2
- Input Data: 1974-2019
  - **Temperature**
  - **Potential Evaporation** (using FAO56 PM method)
  - **Average Areal Precipitation** (using Thiessen method)
  - **Observed Dam Inflow**

✓ The Data received from The Korea Meteorological Administration (KMA) and The Han River Flood Control Office (HRFCO)

METHODOLOGY

Hydrological Model Calibration Strategy *for Climate Change Impacts Study*

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Hydrological Model(GR4J) & Parameters Optimization

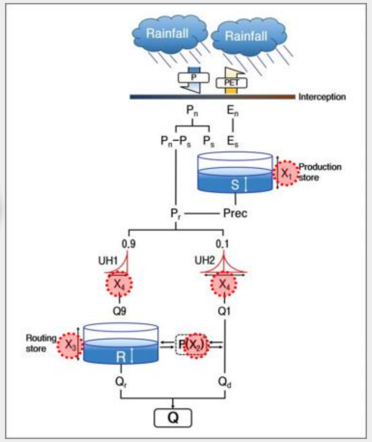
Input Data of a continuous decade

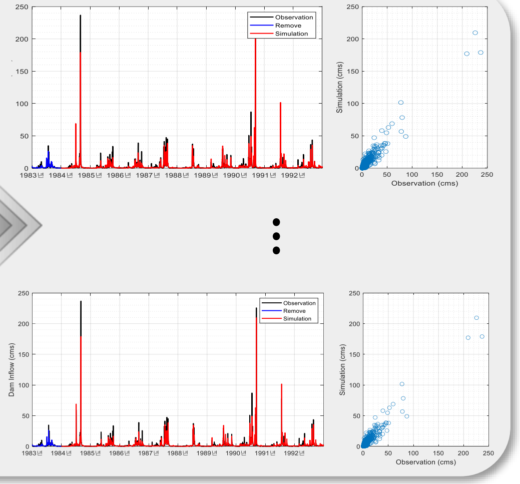
1974-1983
1975-1984
⋮
2010-2019

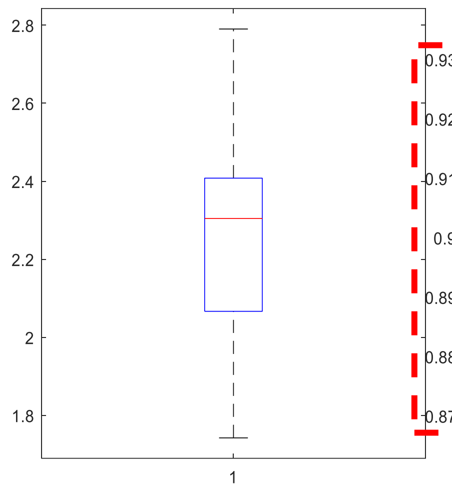
Parameters Range

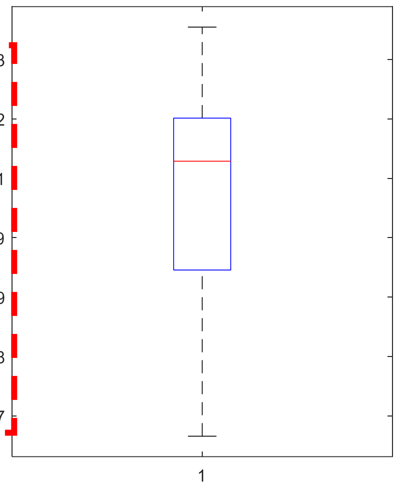
- ✓(0 < X_1 < 200)
- ✓(-10 < X_2 < 7)
- ✓(1 < X_3 < 300)
- ✓(0.5 < X_4 < 3)

Parameters Optimization (SCEM-UA)









Regional Sensitivity Analysis

Latin Hypercube Sampling

Parameters Range

- ✓(0 < X_1 < 200)
- ✓(-10 < X_2 < 7)
- ✓(1 < X_3 < 300)
- ✓(0.5 < X_4 < 3)

S_1: X_1, X_2, X_3, X_4

S_2: X_1, X_2, X_3, X_4

…

S_{3000}: X_1, X_2, X_3, X_4

GR4J

Q_{obs}

Q_{sim}

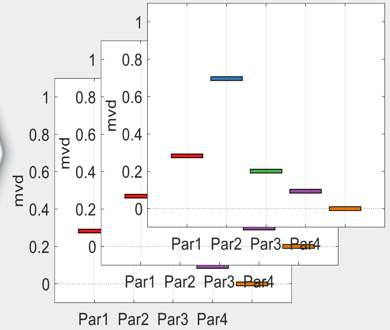
Set Behavioral threshold

- ➢**RMSE** : $\sqrt{\frac{\Sigma(Q_{sim}-Q_{obs})^2}{n}}$
- ➢**BIAS** : $\left|\frac{\Sigma(Q_{sim}-Q_{obs})}{n}\right|$

CDFs of the Non-behavioral

CDFs of the Behavioral

MVD (Maximum Vertical Distance)



RESULTS

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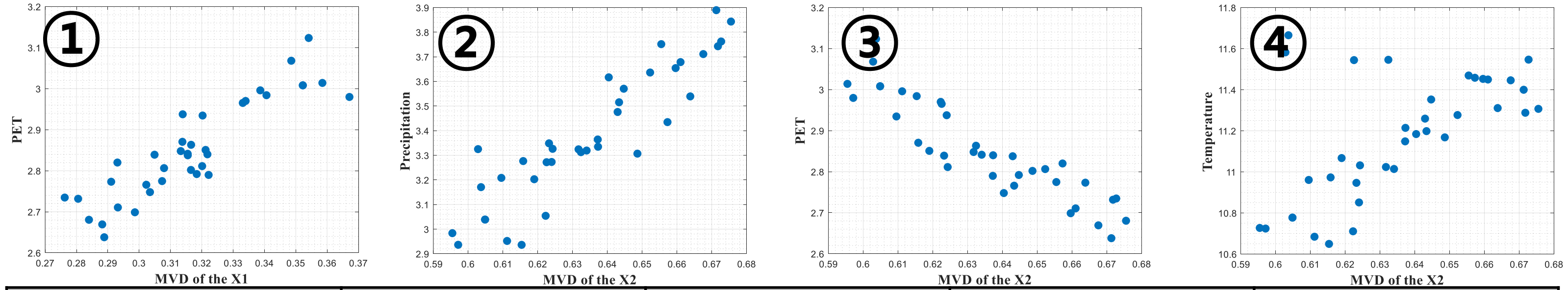
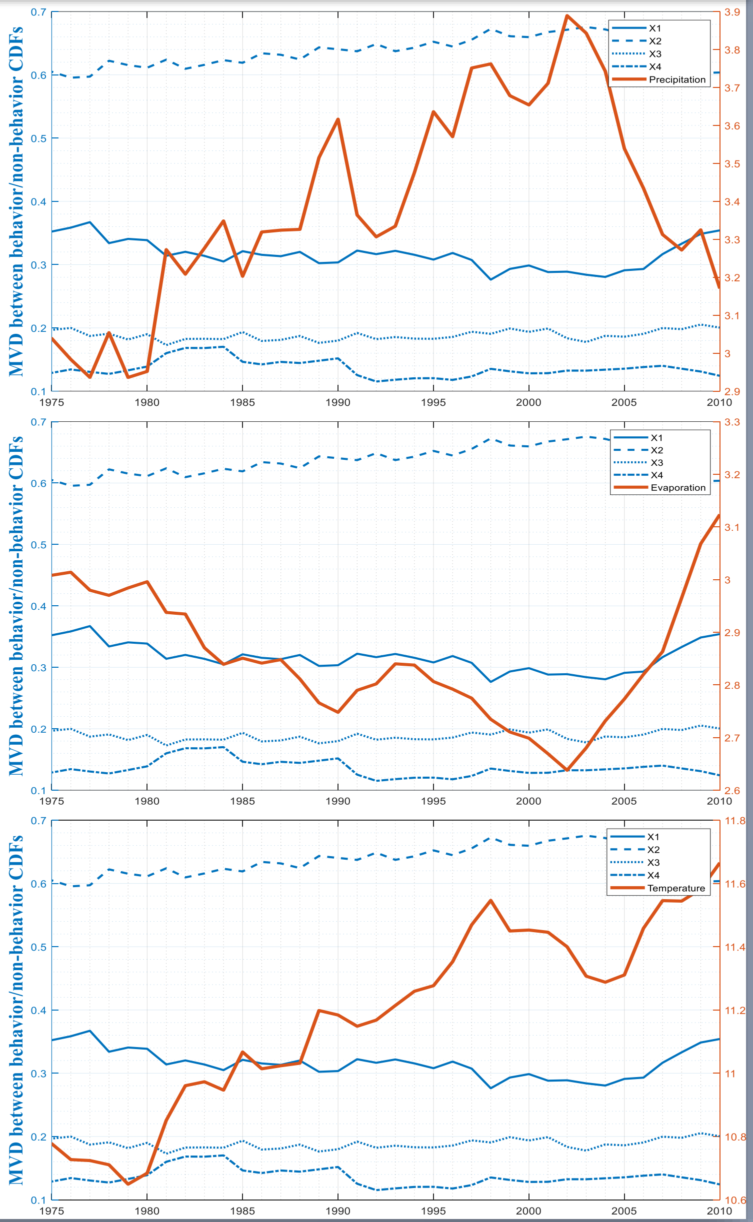
- The Regional Sensitivity Analysis results showed that X2 has the highest sensitivity to runoff simulation in all periods.
- Also, X2's sensitivity shows the highest correlation coefficient with the trend of the hydrometeorological data with a moving window length of 10 years.
- The approach proposed in this study made it possible to develop strategies for hydrological model calibration.



	X_1 mvd	X_2 mvd	X_3 mvd	X_4 mvd
Precipitation	-0.87	② 0.91	-0.16	-0.14
PET	① 0.90	③ -0.91	0.32	0.05
Temperature	-0.50	④ 0.58	0.32	-0.30



Thank you for your attention.

If you have any questions, please e-mail me
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