Czech University of Life Sciences Prague
Faculty of Environmental Sciences

Doudou Ba, Jakub Langhammer, Petr Máca and Ansoumana Bodian

Modelling of changes in hydrological balance in Gambia river basin using two lumped models

Faculty of Science

Charles University
bad@natur.cuni.cz | **www.natur.cuni.cz**

Introduction

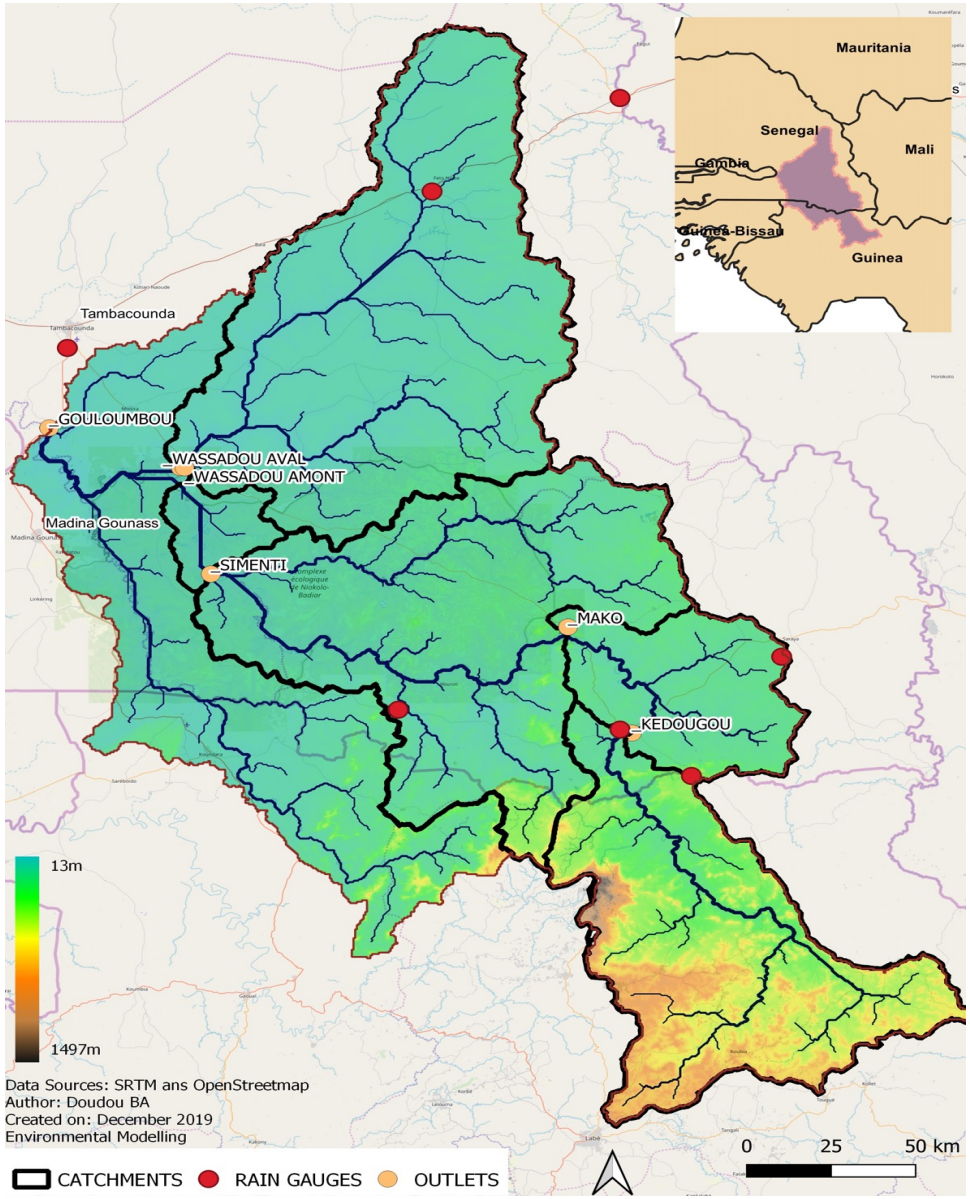
- Calibration performance of hydrological models using (GSST)
- Testing calibration/validation combinations periods
- Lumped models: BILAN and GR2M

Sub-period based on specific climatic characteristic
Seven-year moving window

Objectives:

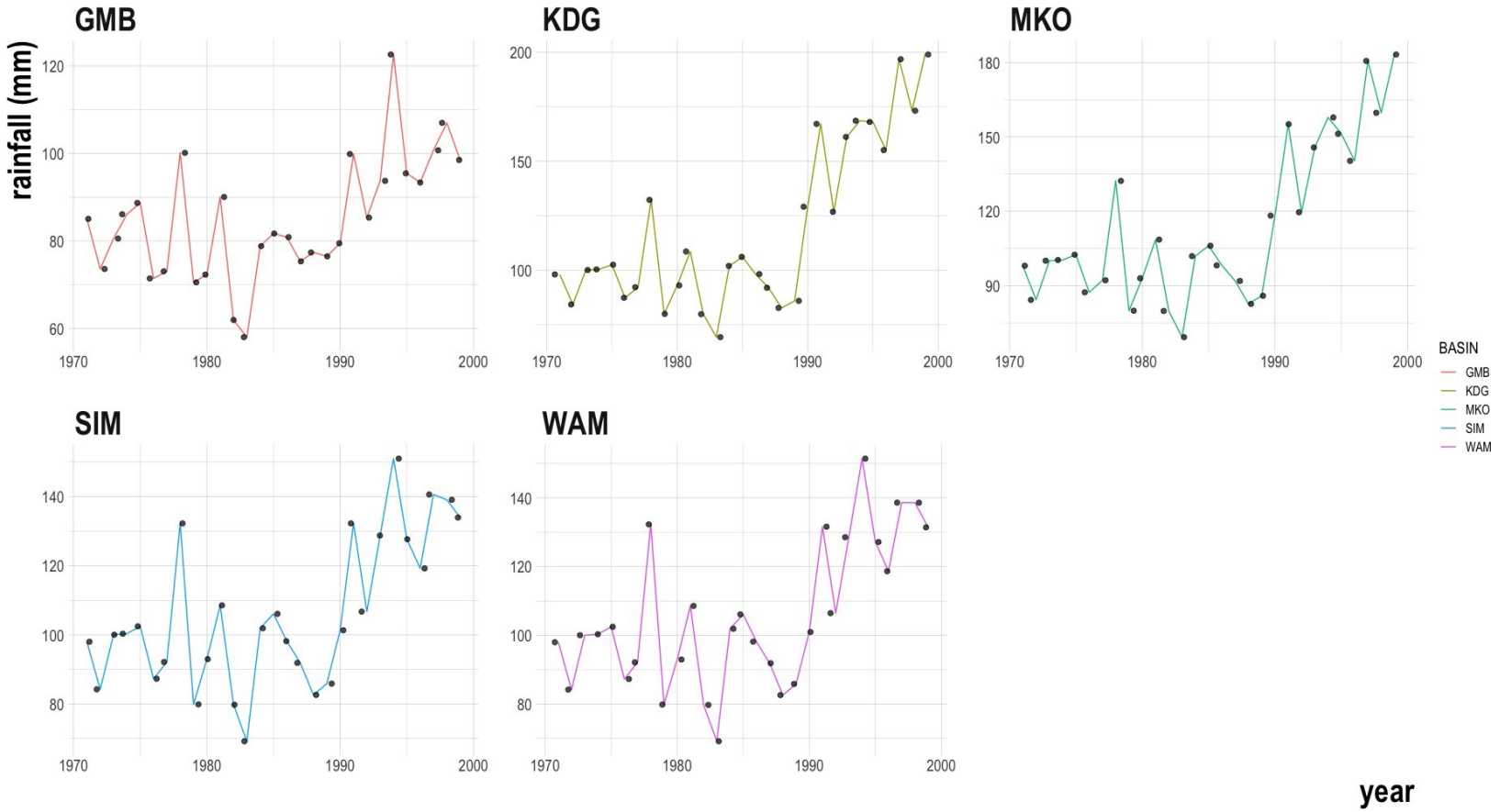
- Crash test BILAN and GR2M models
- How simulation period affect the calibration performance?
- How well models simulate drought / wet periods?
- Which of the selected models has better performance?
- Parameters transferability from calibration to validation?

Fig 1:DEM of 6 Subcatchments of the Gambia river basin.



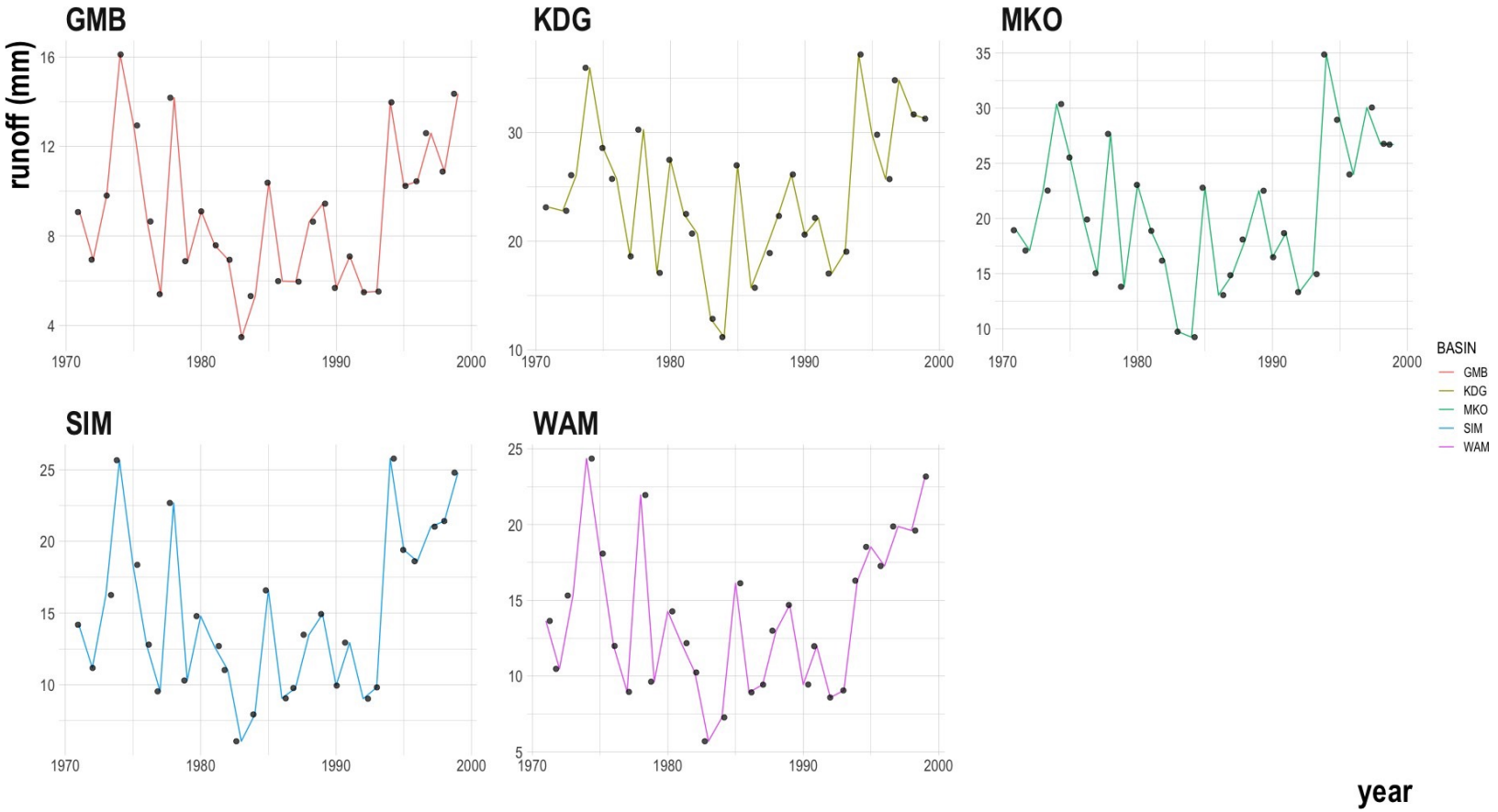
Material and methods

Fig 2:Mean Annual Rainfall, GMB(Gouloumbou), KDG(Kedougou), MKO(Mako), SIM(Simenti), WAM(Wassadou-Amont), WAV(Wassadou-Aval)



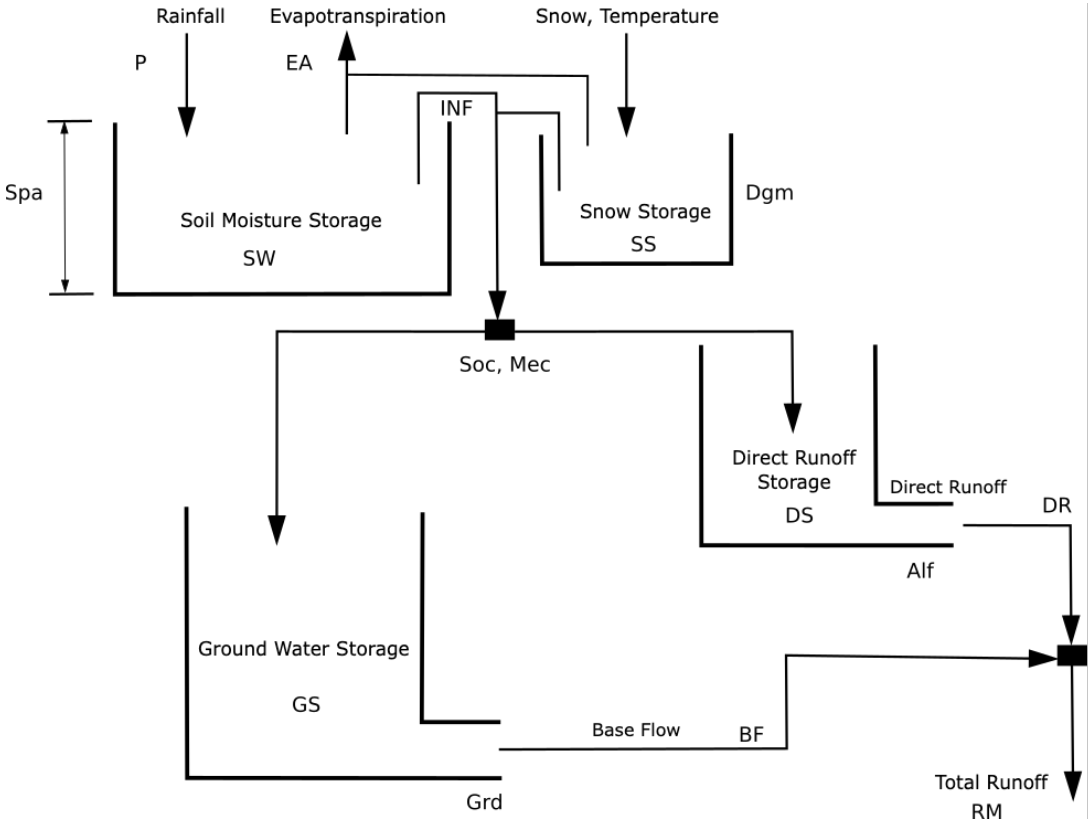
Materials and methods

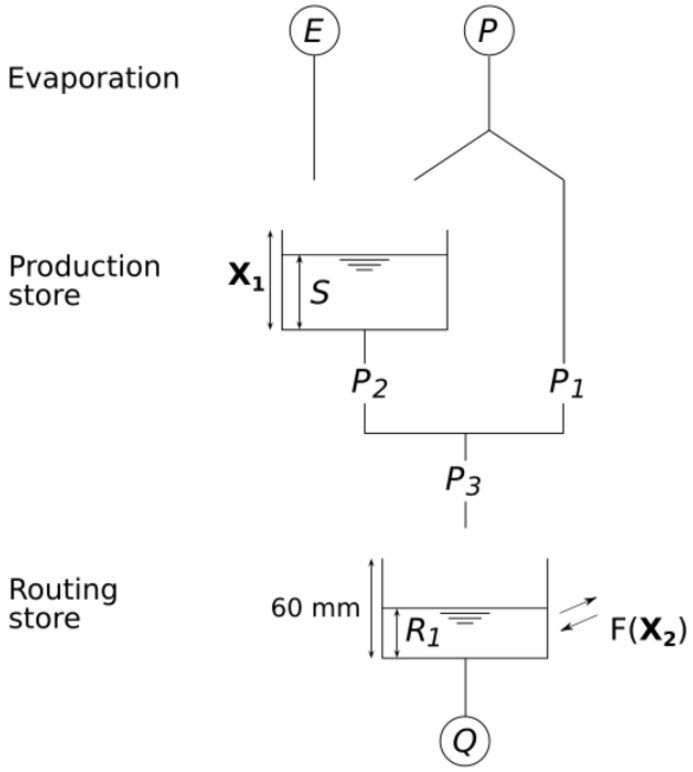
Fig 3:Mean Annual Runoff, GMB(Gouloumbou), KDG(Kedougou), MKO(Mako), SIM(Simenti), WAM(Wassadou-Amont), WAV(Wassadou-Aval)



Material and methods

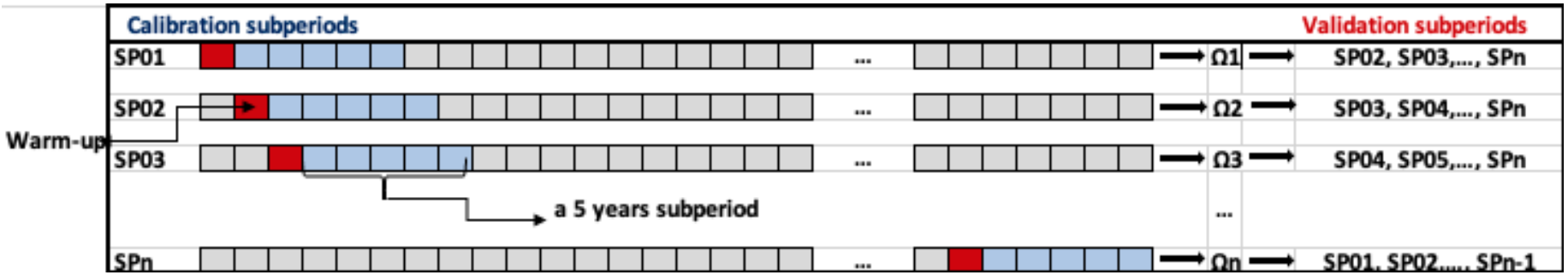
Fig 4:Diagrams of BILAN (left) and GR2M (right) model description





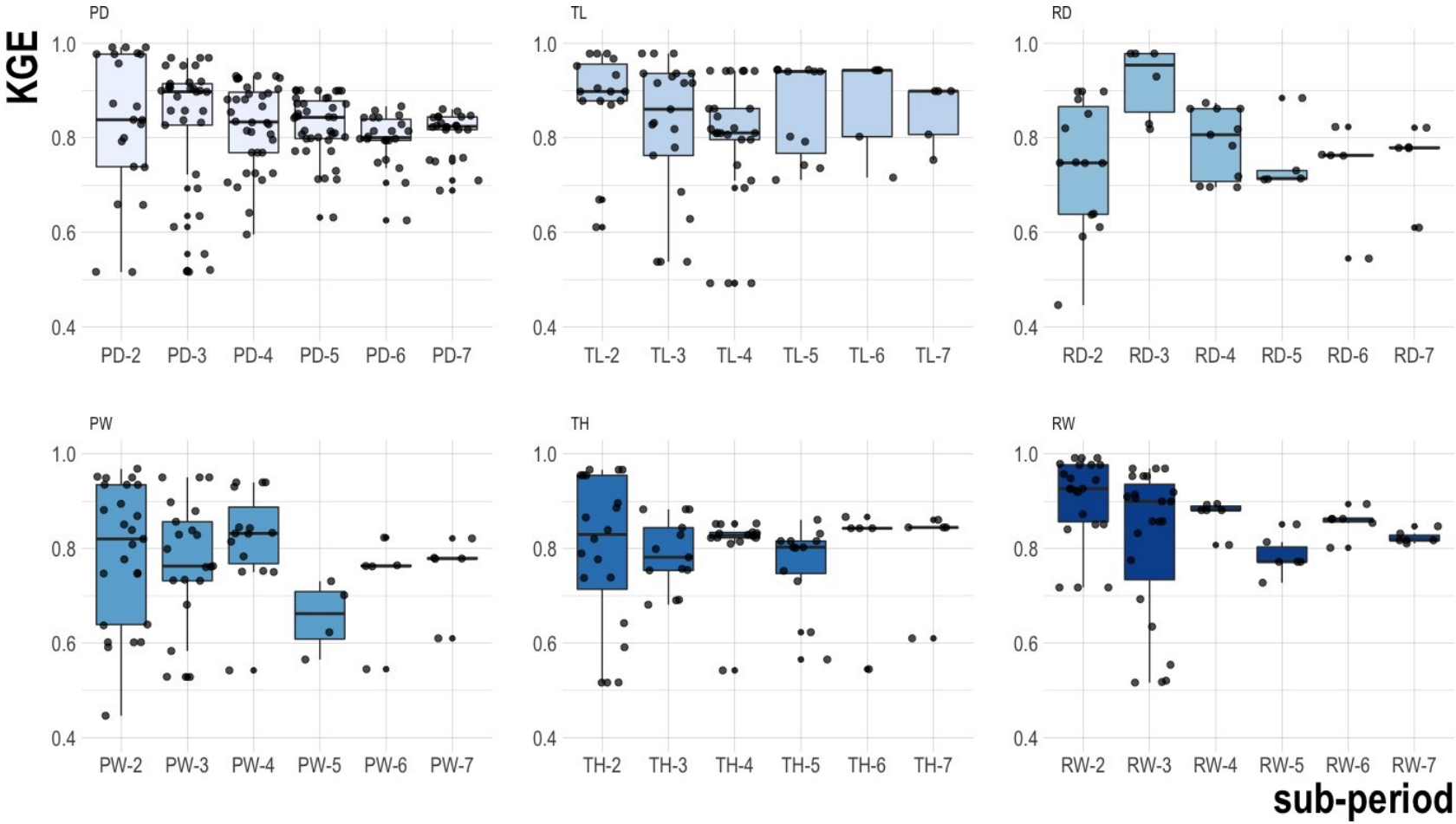
Materials and methods

Fig 5:Methodology of generation of sub-periods with a 5 year sliding window adapted from [**Coron2012**] and [**Vormoor2018**].



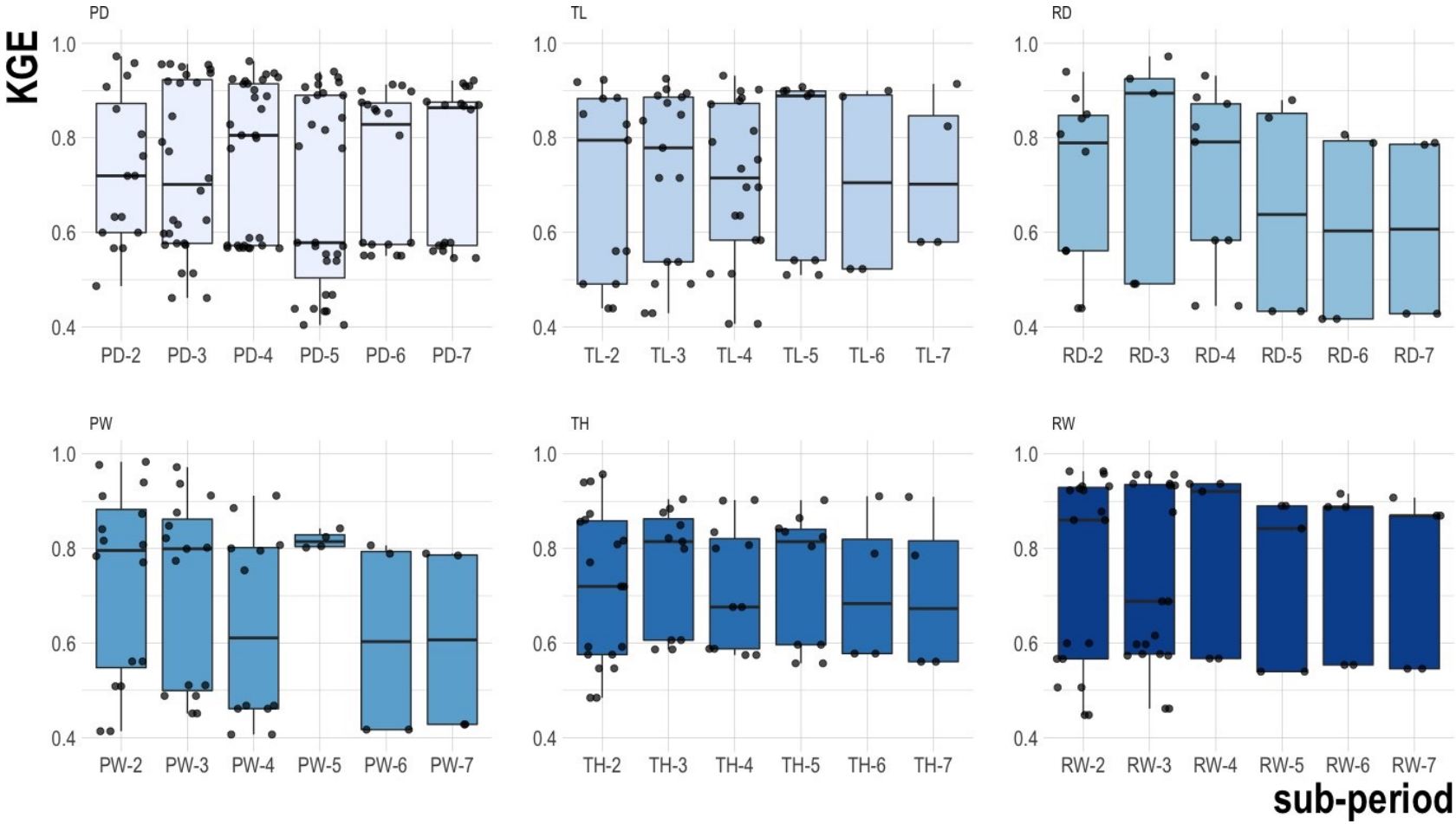
Results

Fig 6:Boxplot of overall Calibration Performance of BILAN model



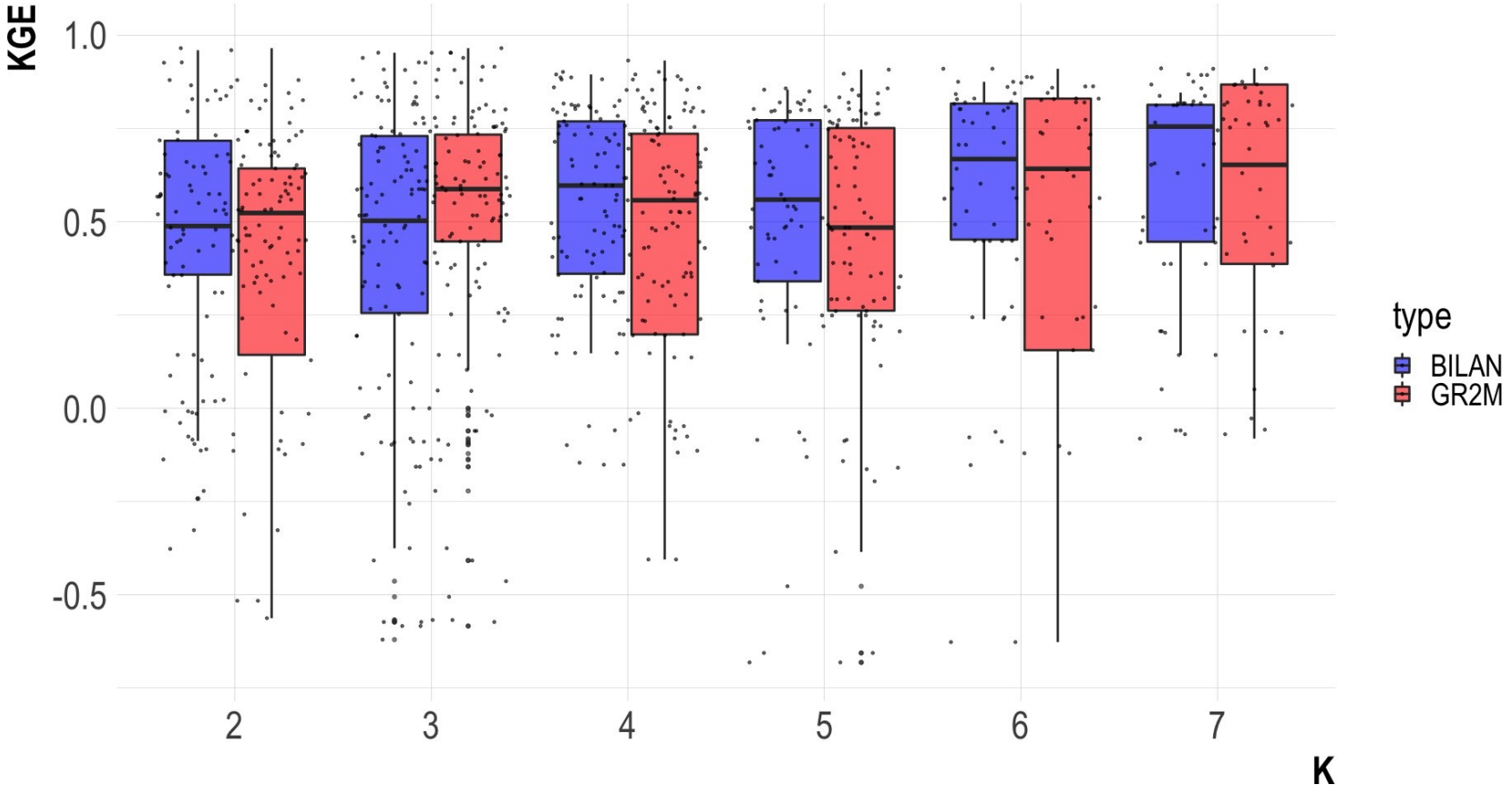
Results

Fig 7:Boxplot of overall Calibration Performance of GR2M model



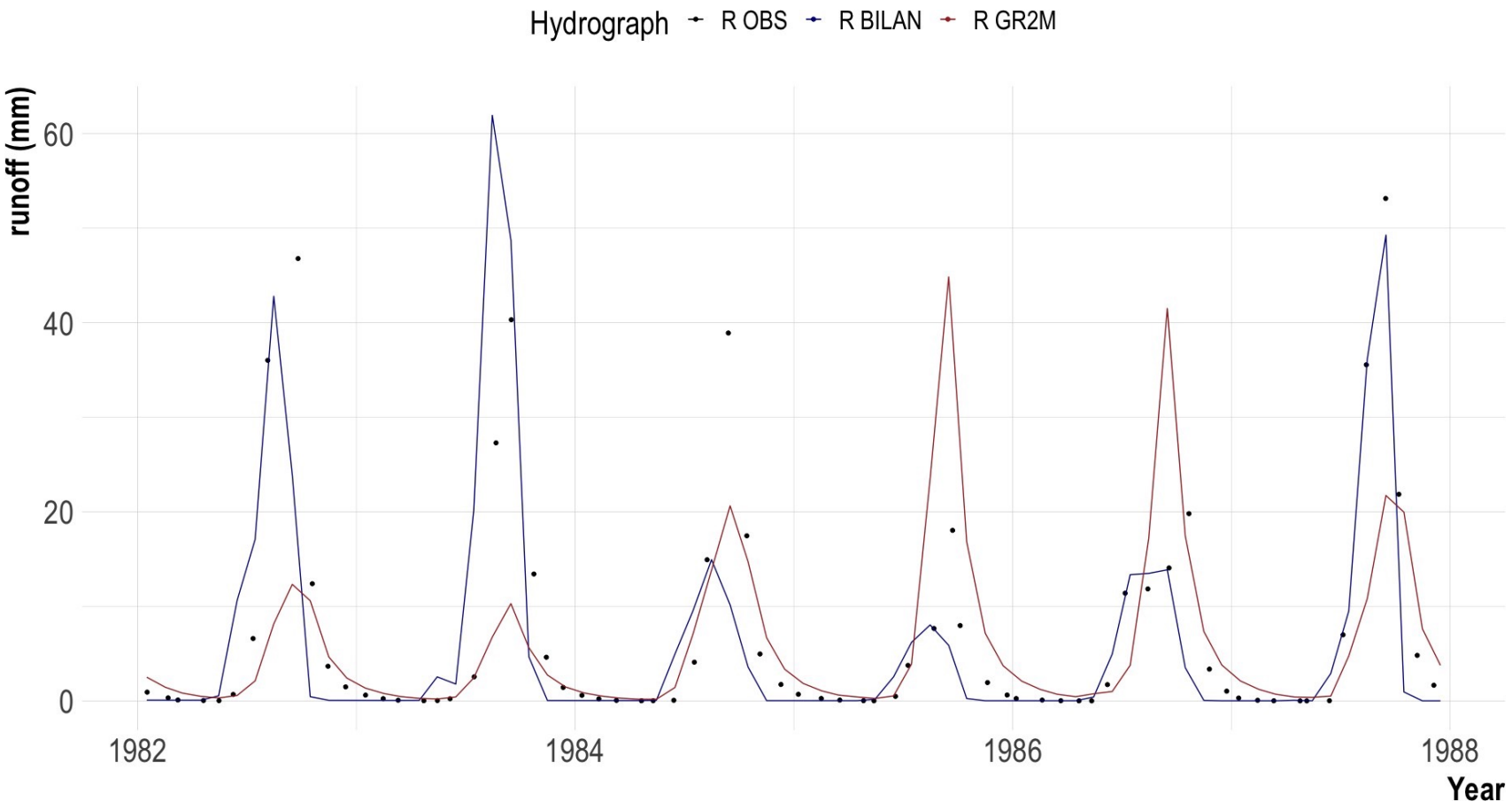
Results

Fig 8:Overall validation result of BILAN and GR2M model without distinction of climate variable.



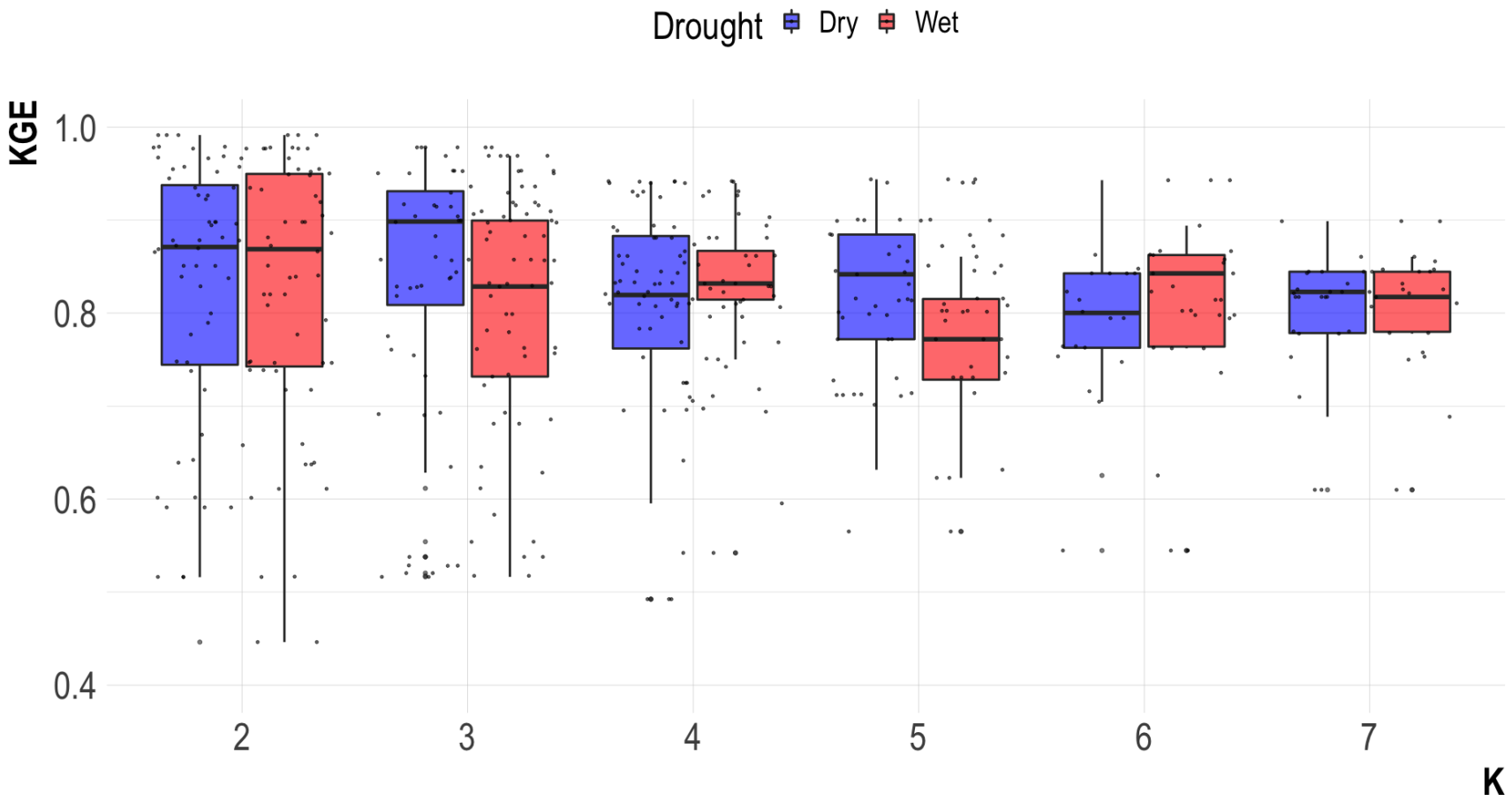
Results

Fig 9:Monthly Observed Runoff (R OBS) and Simulated Runoff of BILAN and GR2M model, at GOULOUMBOU catchment, during Calibration on an in-dependant 6 year sub-period



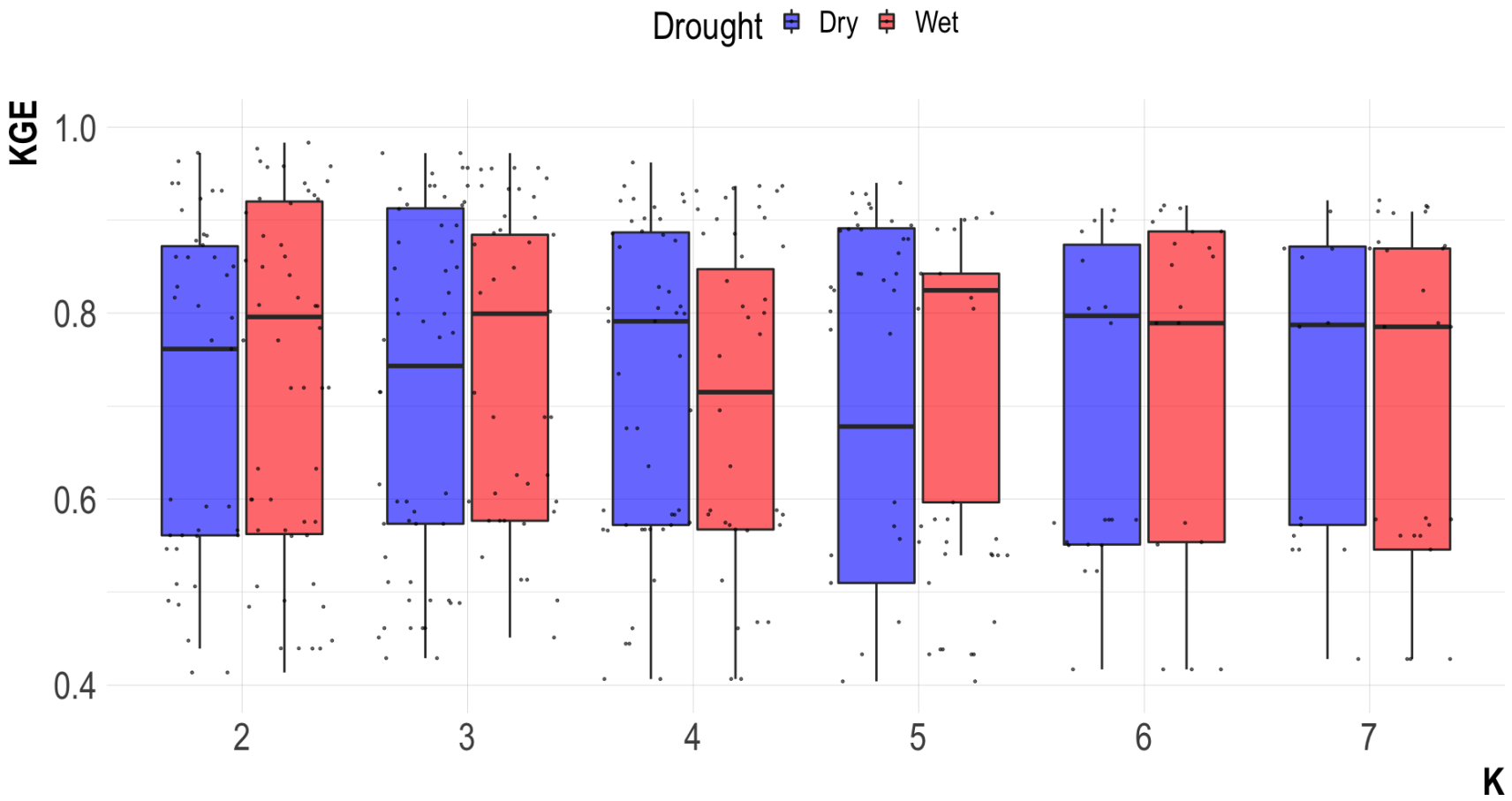
Results

Fig 10:Impact of Drought on Calibration Performance of BILAN model



Results

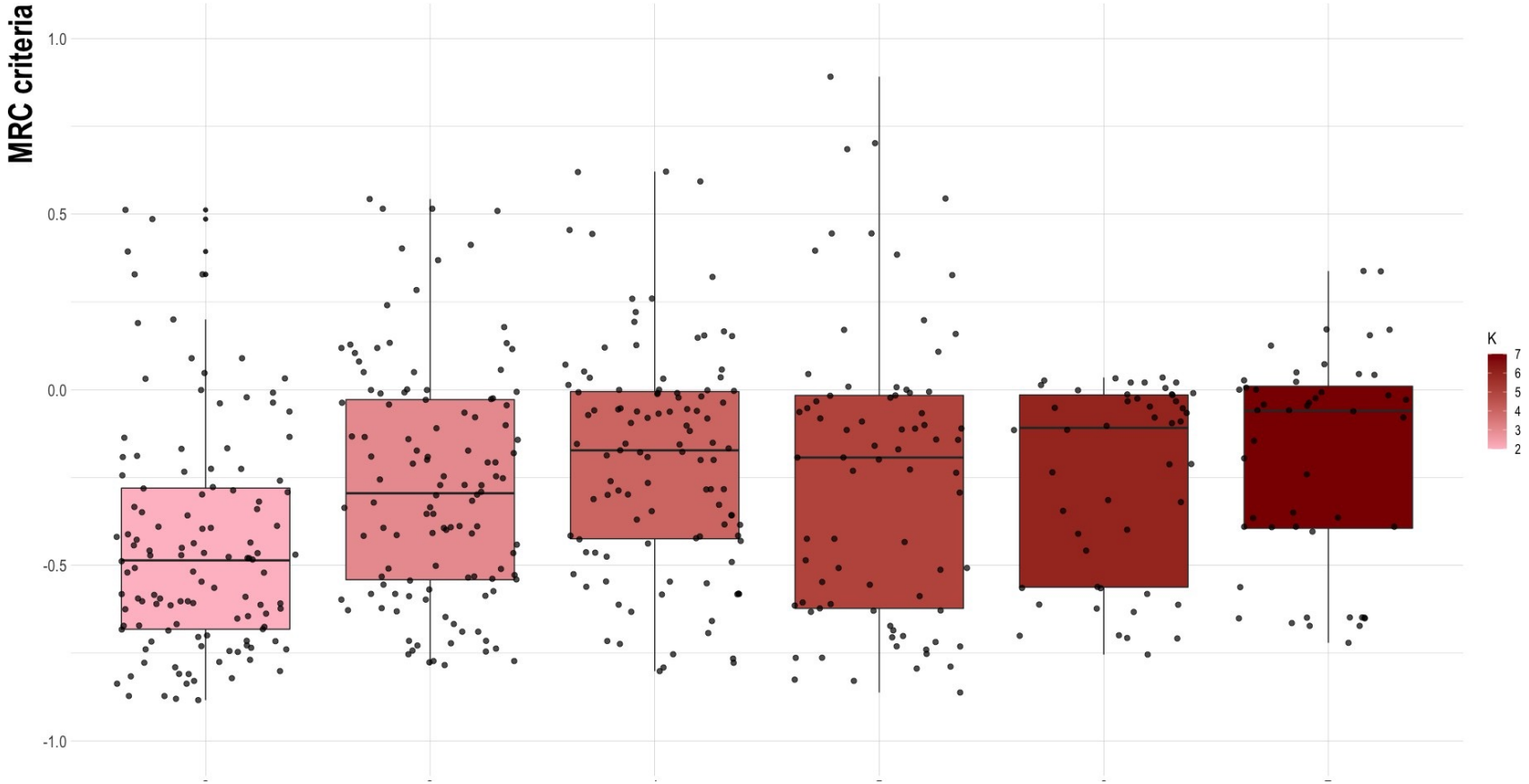
Fig 11:Impact of Drought on Calibration Performance of GR2M model



Results

$$MRC_{C-V} = \frac{\bar{\varepsilon}_C}{\bar{\varepsilon}_V} - 1 \qquad (3)$$

Fig 12:Boxplot overall Performance loss of BILAN model using MRC to RMSE without distinction of Period



Conclusion

Considering:

- research basin selection,
- quality of input data,
- selection of calibration periods,
- selection of hydrological models,
- calibration method
- and the use of various optimized parameters

Careful consideration should be given to reducing the uncertainty associated with hydrological models.

Changes may lead to different results and different conclusions.

The outcome may lead to a master of uncertainty associated with hydrological models and better runoff assessment for future climate change studies.

Thank you for your attention

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Faculty of Science
Charles University
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