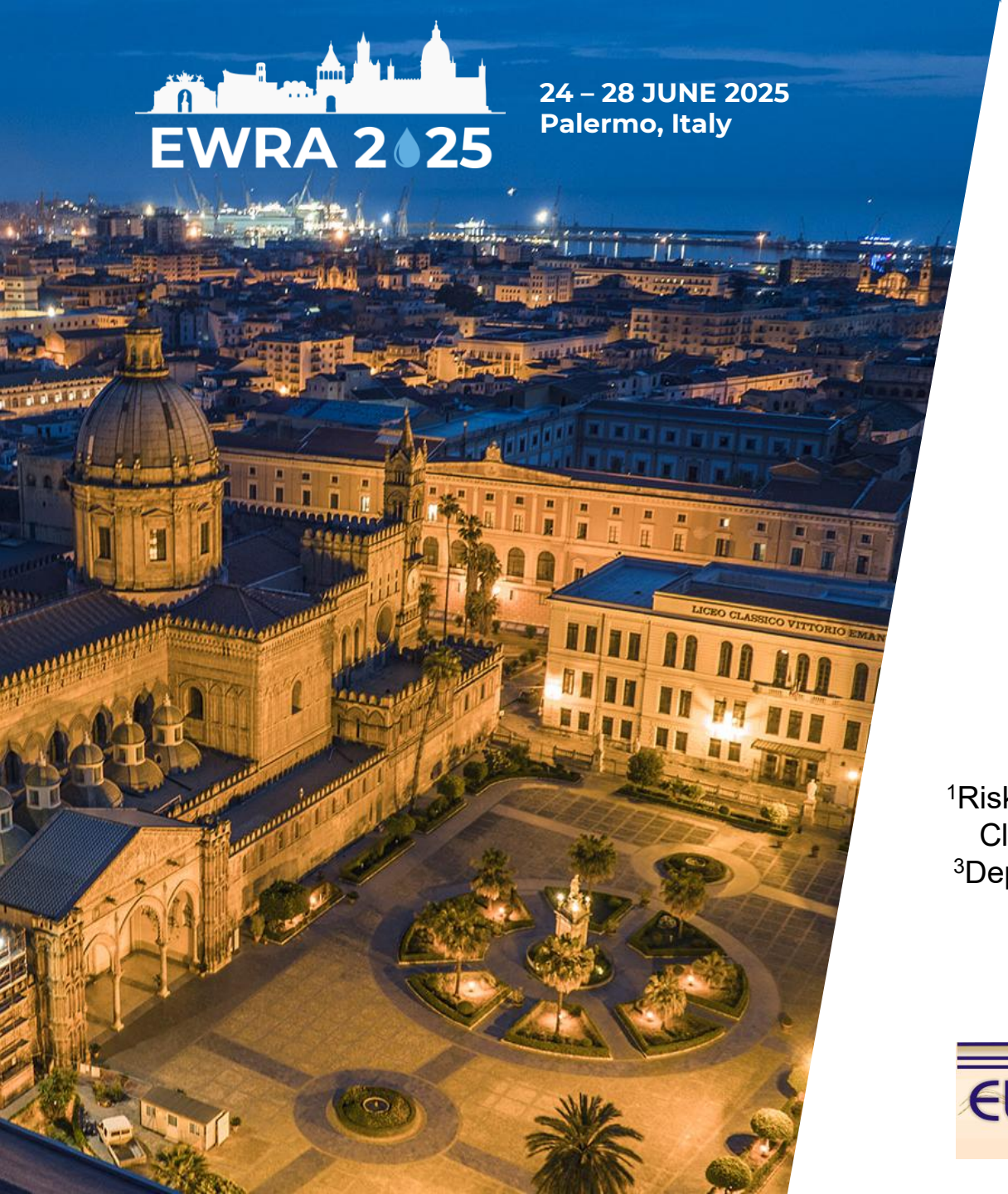

XIII WORLD CONGRESS

of the European Water Resources Association

New challenges in understanding and managing water-related risks in a changing environment

Uncertainty assessment of rainfall-runoff simulation of the Reno Italy river basin under climate change scenarios

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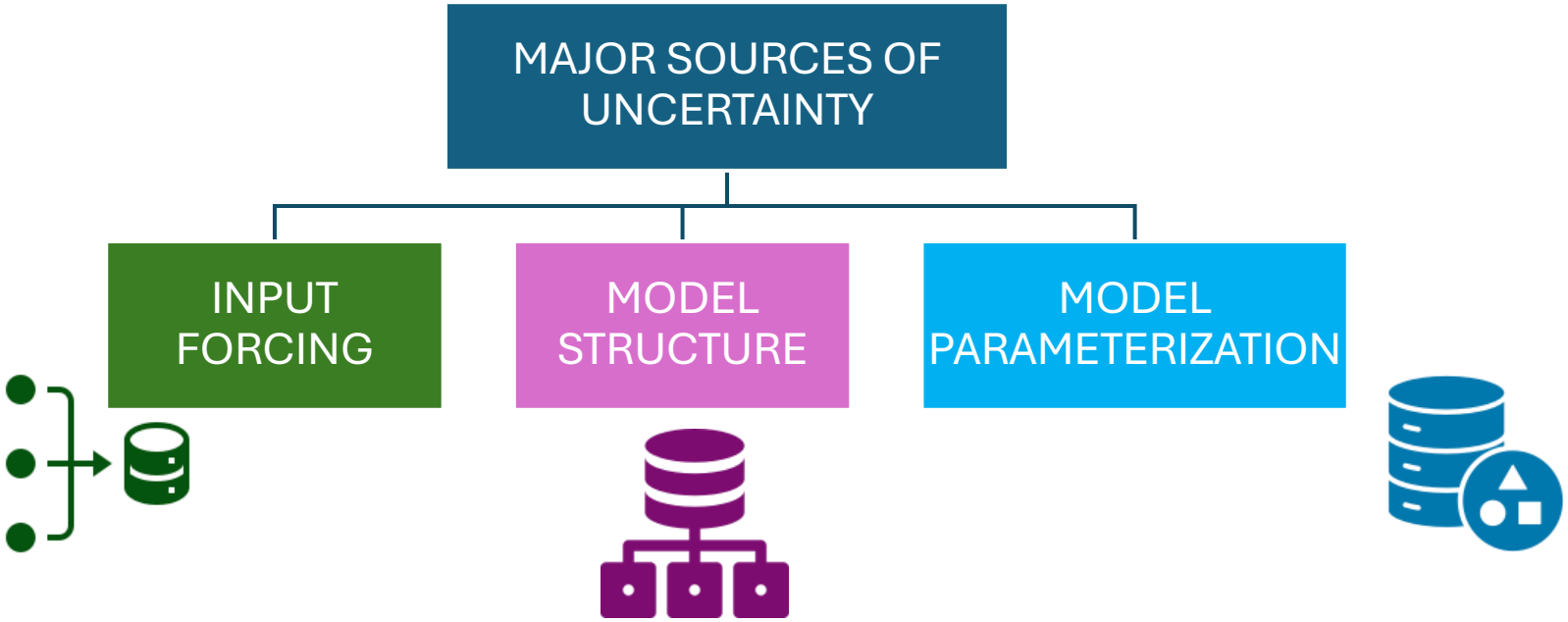
Introduction

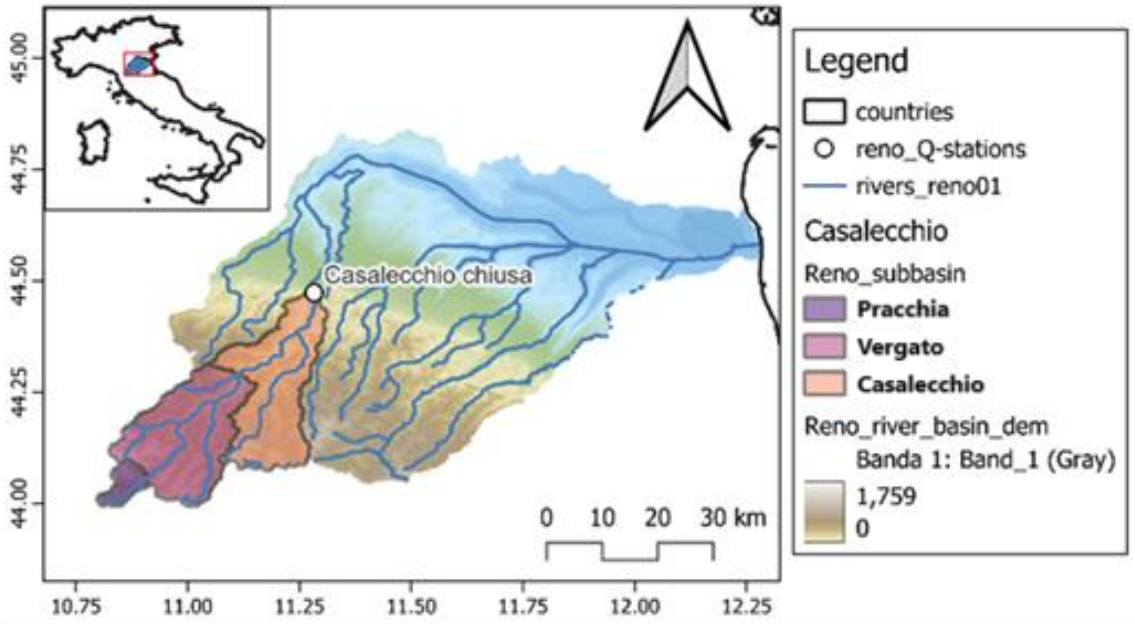
Uncertainty assessment is crucial for rainfall-runoff simulations in a typical watershed.



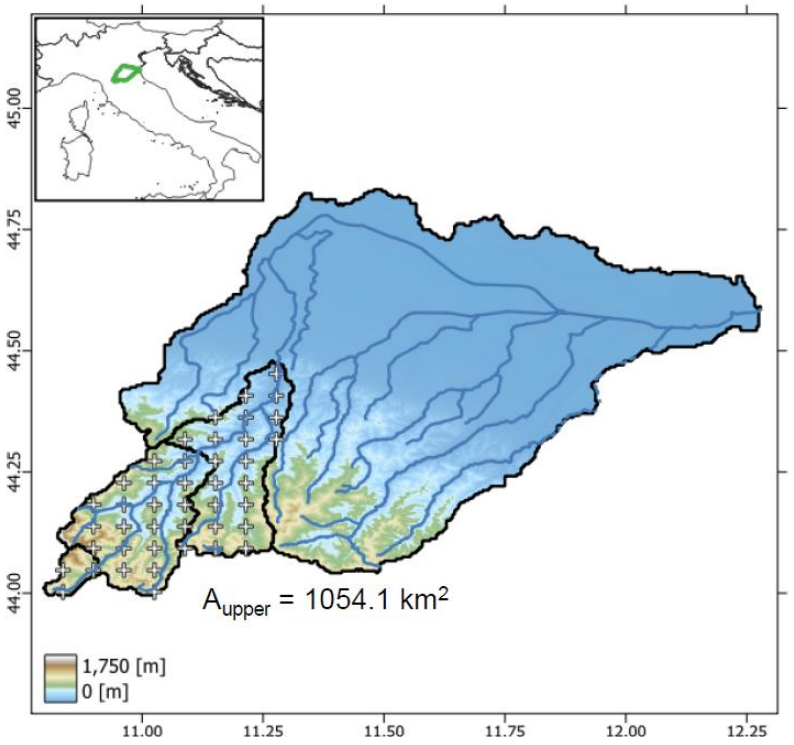
This study aims to investigate the uncertainty of future streamflow using a semi-distributed hydrological model in the Reno basin, Italy.

Materials and methods

The **upper Reno River Basin** in northern Italy was selected as the case study and divided into three sub-basins



For calibrating the hydrological model, high-resolution (5-km) gridded meteorological data, called the ERG5 dataset and developed by ARPAe-SIMC (Antolini et al., 2016), was aggregated and averaged for each sub-basin.



Materials and methods

Hydrological Model: HYPE (developed by SMHI); semi-distributed, process-based

Input data: daily precipitation and temperature of three sub-basins

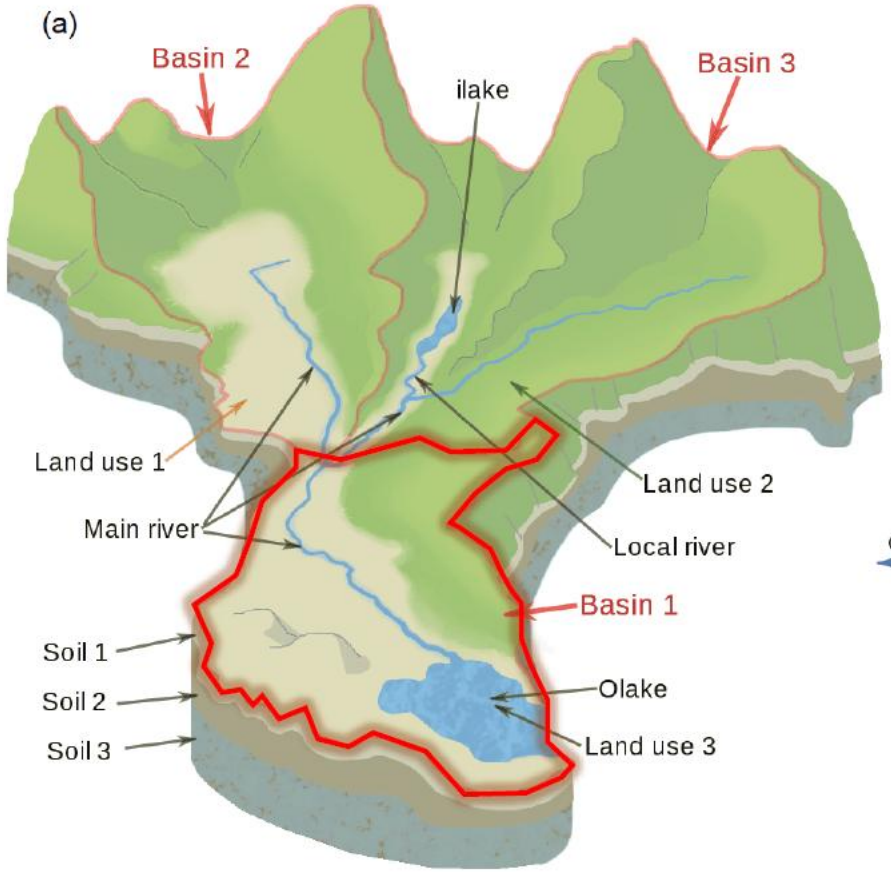
Output data: daily streamflow at the Casalecchio station

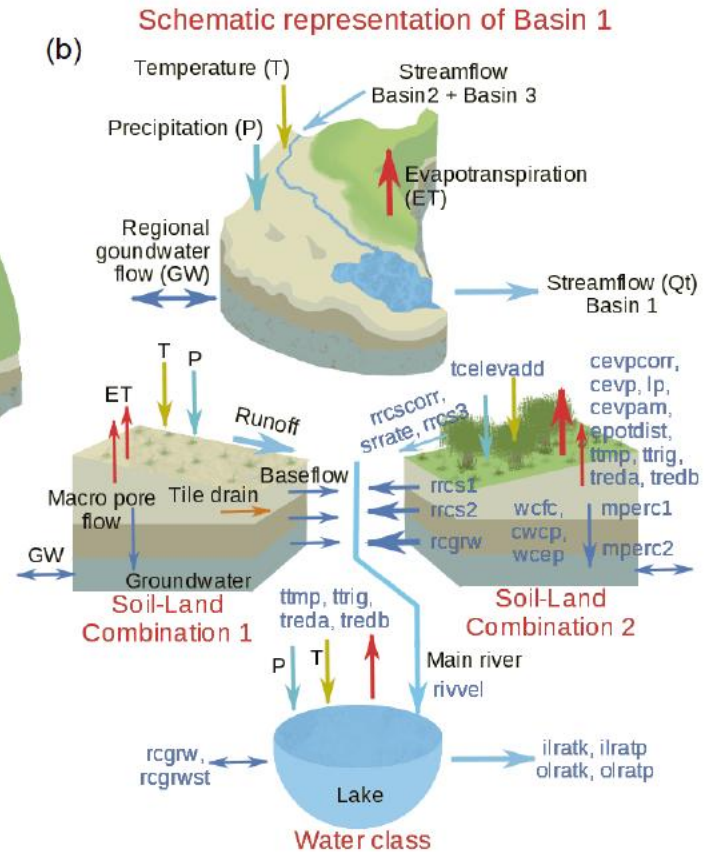
Calibration period: 2001- 2018

Validation period: 2019 – 2022

Calibration KGE[1]: 0.835

Validation KGE: 0.813





(Arciniega-Esparza et al., 2022)

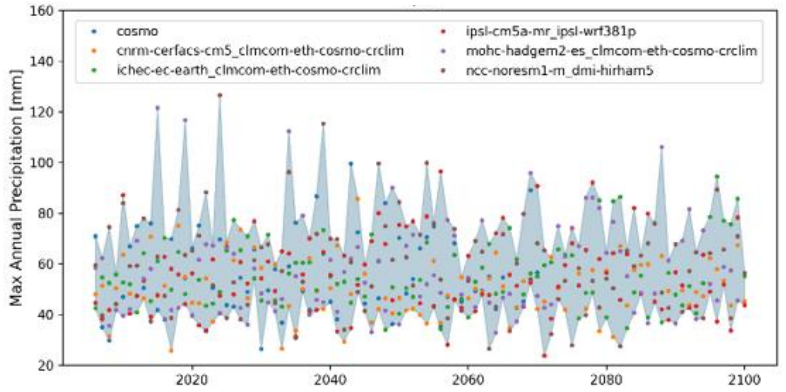
[1] Kling-Gupta Efficiency

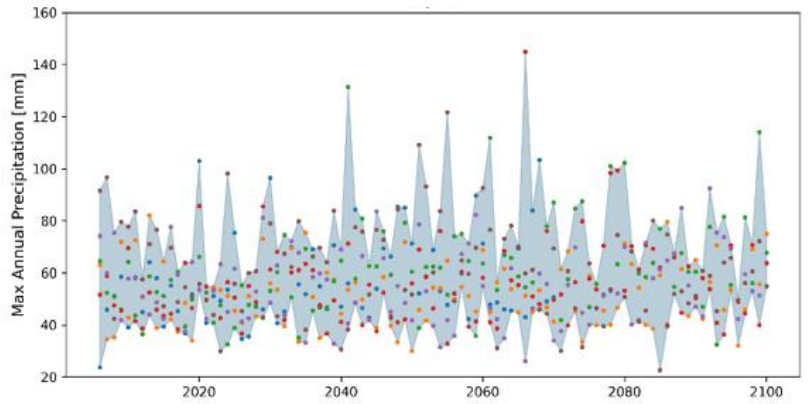
Materials and methods

The calibrated HYPE model simulated **6 future projections** (one at 2.2km resolution, and five at 12 km resolution) for IPCC **RCP4.5** and **RCP8.5** climate scenarios.

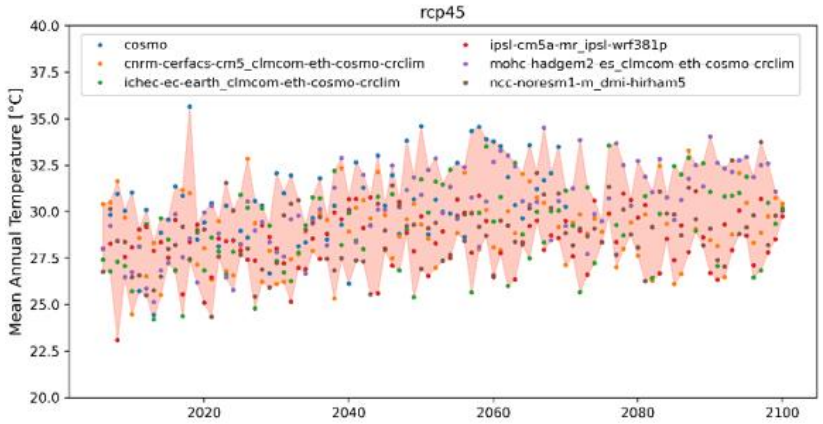
RCP4.5 RCP8.5

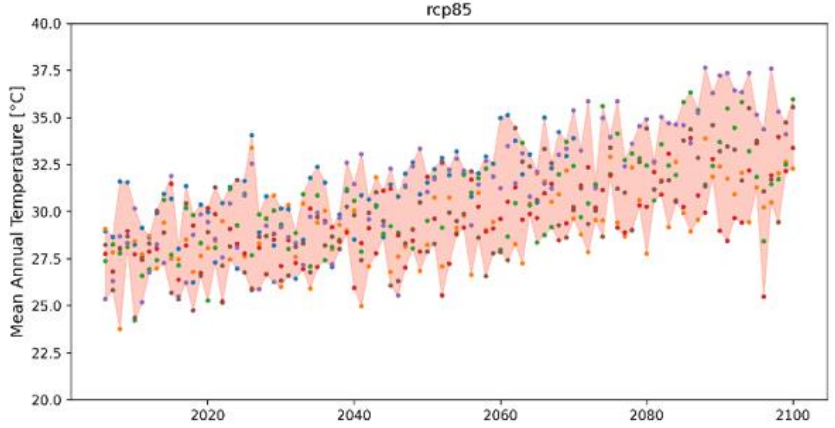
PRECIPITATION





TEMPERATURE

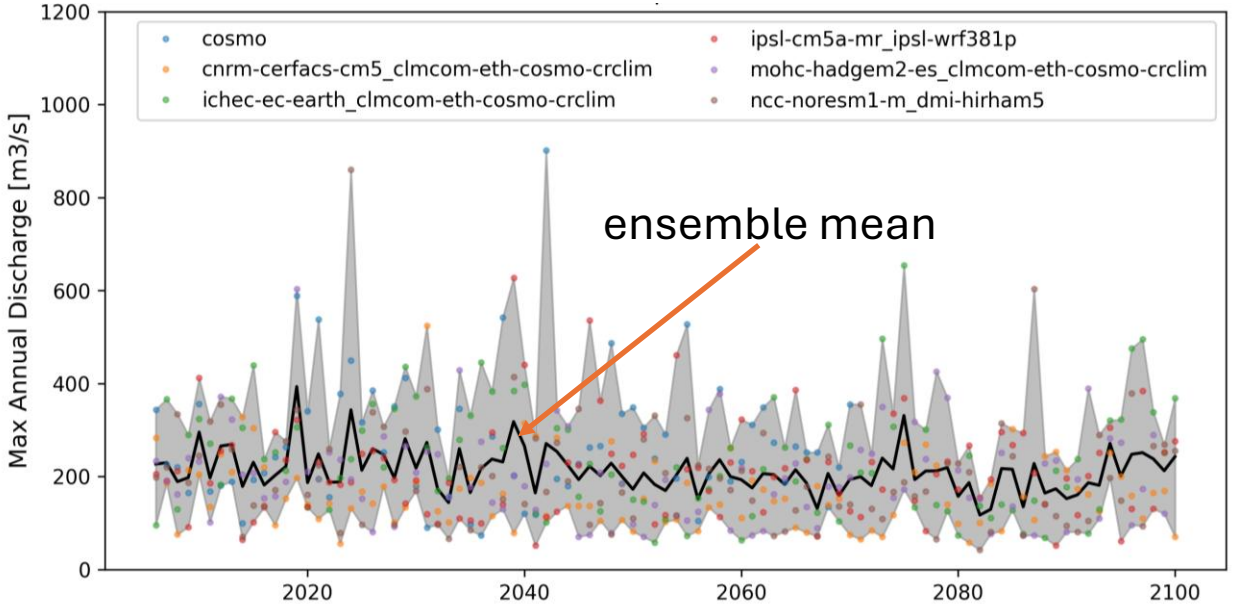




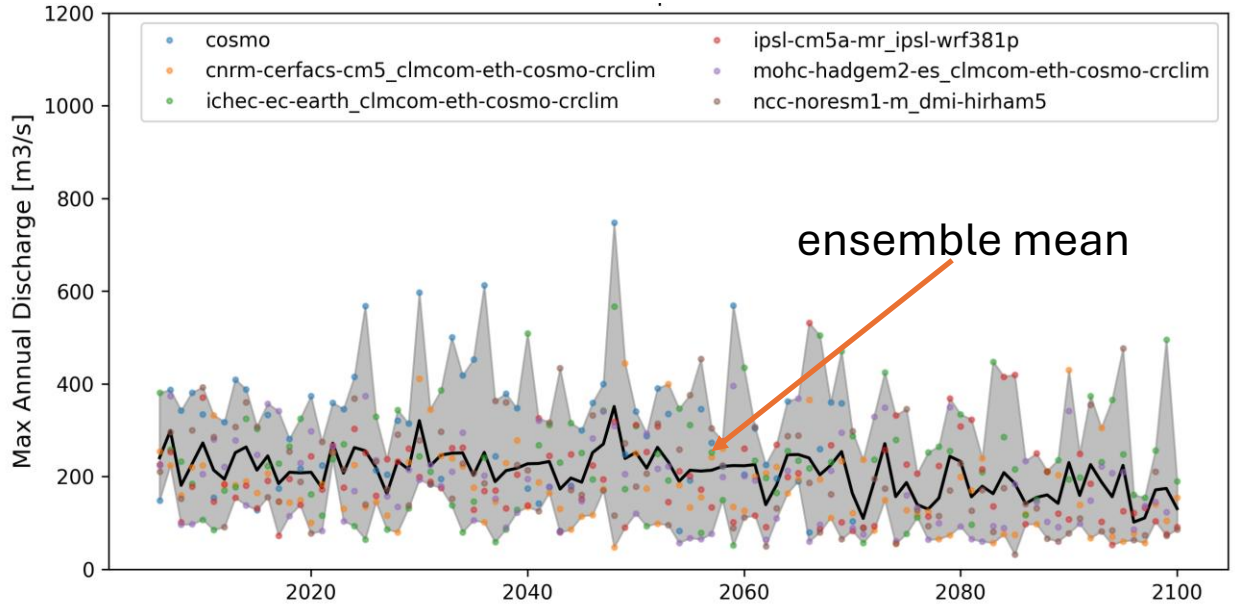
Results

The maximum annual discharge at the outlet of the basin was obtained from 2006 to 2100 for different future projections.

RCP4.5



RCP8.5



For both RCP scenarios, all climate models indicate a decrease in the average maximum annual discharge in mid-century.

Concluding remarks

The obtained results revealed that studying the model uncertainty can provide a better understanding of water balance in a typical watershed, particularly when forecasting streamflow under climate change scenarios.

Uncertainty assessment is fundamental when considering future scenarios of water availability.

Adaptation policies tackling water scarcity scenarios should also include future scenarios and be based on uncertainty assessment.

References:
Antolini, G., Auteri, L., Pavan, V., Tomei, F., Tomozeiu, R. and Marletto, V. (2016) A daily high-resolution gridded climatic data set for Emilia-Romagna, Italy, during 1961–2010. Int. J. Climatol., 36: 1970-1986. https://doi.org/10.1002/joc.4473
Arciniega-Esparza, S., Birkel, C., Chavarría-Palma, A., Arheimer, B., & Breña-Naranjo, J. A. (2022). Remote sensing-aided rainfall–runoff modeling in the tropics of Costa Rica. Hydrology and Earth System Sciences, 26(4), 975-999. https://doi.org/10.5194/hess-26-975-2022

Thank you for your attention!

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