DESTINATION EARTH

Climate Digital Twin (DE340)

Towards climate adaptation in water management using high-resolution simulations in HydroRiver: A case study within the DestinE climate adaptation digital twin

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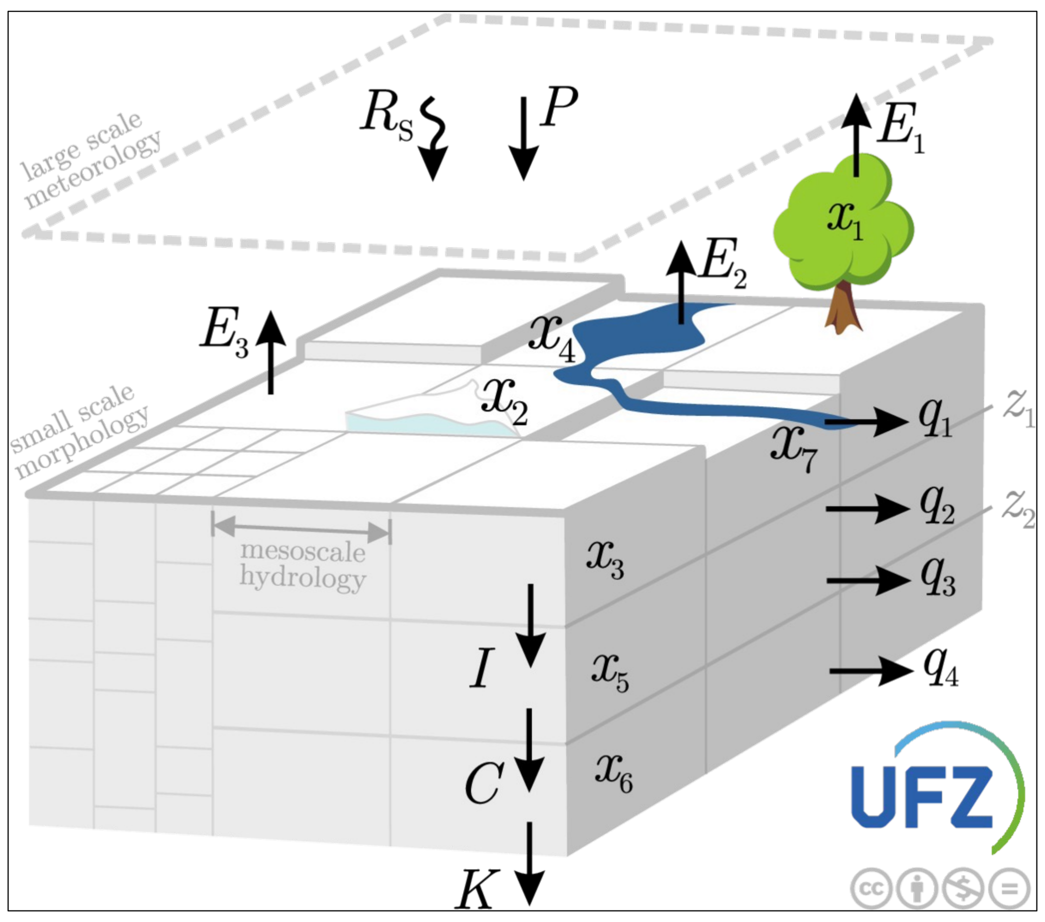
INTRODUCTION

Climate change can have a considerable impact on future water availability. A reliable estimate of the extent of future droughts and floods is critical in creating climate change adaptation measures.

This work utilizes the mHM model as an impact model, and the ICON and IFS high-resolution climate simulations as the forcing to simulate key hydrological process and variables of interest. The application is co-designed with users / stakeholders from various impact sectors.

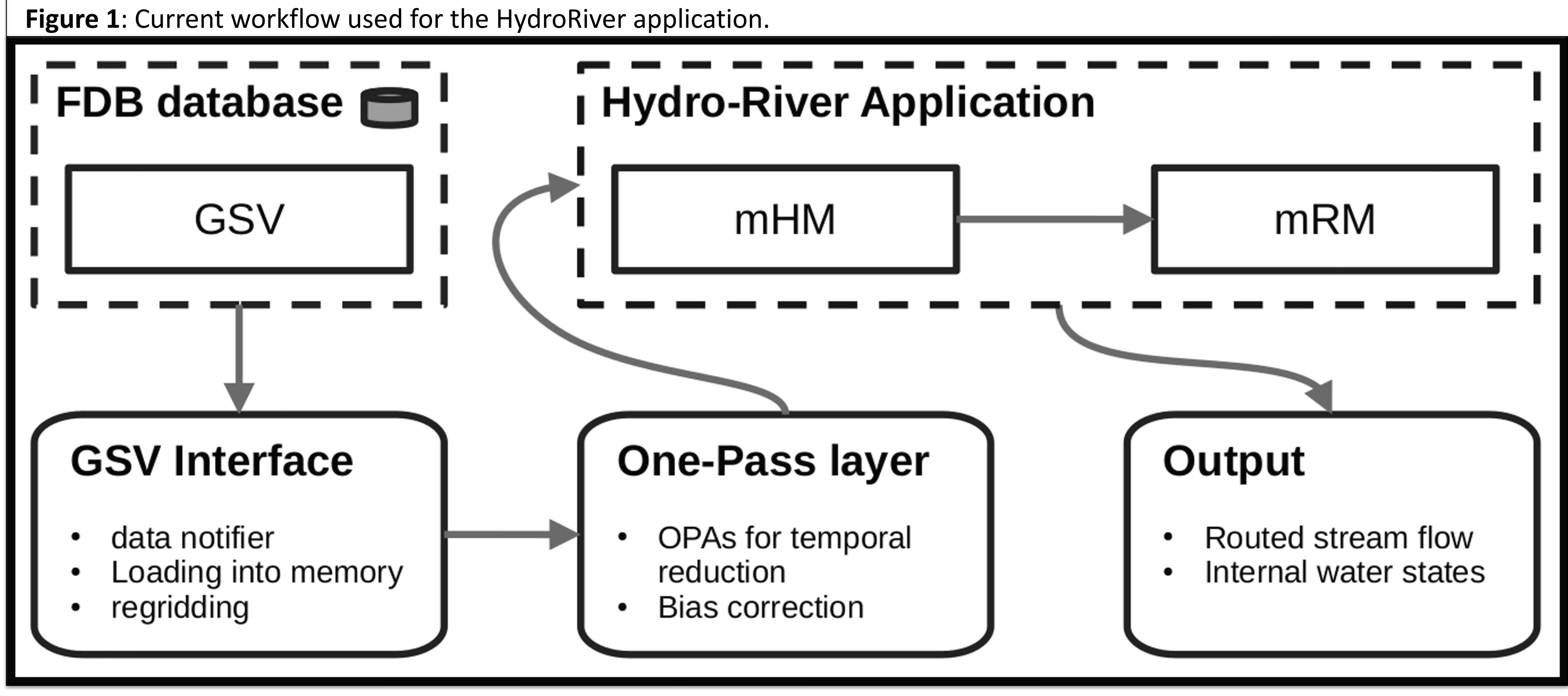


USER REQUESTS

Needs	Variables / Requirements
Inputs for native groundwater model	Run-off, Fast and slow interflow, soil moisture
Understand the impact of drought and food events on water quality	River discharge, Run-off, Precipitation
Provide indicators of interest to their stakeholders on annual water scarcity	River discharge, Run-off, soil moisture, groundwater recharge
Understand the risk of overheating and leaking of sewer pipelines in the city due to increased temperature resulting from climate change	Skin temperature (temperature at 2m)

IMPLEMENTATION IN THE WORKFLOW

Figure 1: Current workflow used for the HydroRiver application.

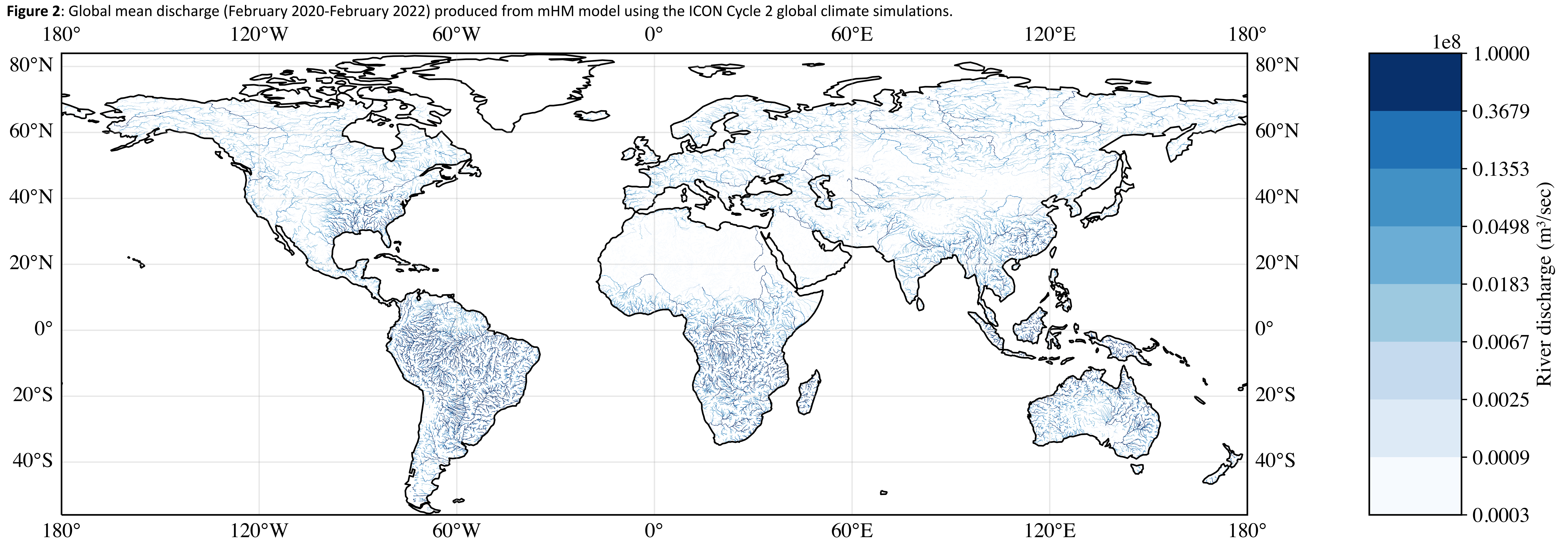


Current work regarding the workflow implementation is focused on developing a container for the application (including software dependencies). We request meteorological variables (e.g., precipitation, temperature) from the GSV. These variables are then passed to the one pass algorithm to calculate daily aggregates. The daily aggregates are used to bias-correct hourly values and to calculate daily potential evapotranspiration that is subsequently disaggregated to hourly values. The corrected hourly values are then ingested into mHM (mhm-ufz.org) and mRM that calculate stream flow and other internal state variables (e.g., soil moisture, snow coverage, recharge) if these are required by users.

RESULTS

The results presented are the simulated 2-year mean (February 2020 – February 2022) river discharge (Figure below) obtained from the ICON Climate simulations from the NextGEMS Cycle 2 (https://nextgems-h2020.eu) climate runs. The NextGEMS climate runs were used to provide a proof-of-concept for the mHM model, and used to present to the users to collect early user requirements.

Figure 2: Global mean discharge (February 2020-February 2022) produced from mHM model using the ICON Cycle 2 global climate simulations.



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