It's impolite to zoom in on global hydrological models

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Introduction

Large scale or global hydrological models (GHMs) show promise in enabling us to accurately predict floods, droughts, navigation hazards, reservoir operations, and many more water related issues. As opposed to regional hydrological models that have many parameters that need to be calibrated or estimated using local observation data (Sood and Smakhtin 2015).

GHMs are able to simulate regions that lack observation data, whilst applying a uniform approach for parameter estimation (Döll, Kaspar, and Lehner 2003; Widén-Nilsson et al. 2009). Up until recently the GHMs used coarse modelling grids of around 0.5 to 1 degree spatial resolution. However, due to advances in satellite data, climate data, and computational resources, GHMs are modelling on higher resolutions (up to 200 meters). This raises the question about how these models can be adjusted in order to take advantage of the finer modelling grid.



TUDelft

- Physically based distributed hydrological model
- Can run with any time step.
- Spatial distribution within the hyper-resolution domain.
- Single parameter calibration.

Study concept

In this study, we carry out an assessment of how changes in spatial resolution affect the simulations of the Wflow SBM model for basins in the Continental United States.

This is done by comparing the model states and fluxes at three spatial resolutions, namely 3 km, 1km, and 200m. A hypothesis driven approach is used to investigate why changes in states and fluxes are taking place at different spatial resolutions and how they relate to model performance. The latter is determined by validating river streamflow.

In addition, we make use of two sets of parameters that rely on different pedo-transfer functions. Further investigating the role of parameterization in conjunction with changes in spatial resolution.

Combining all results from multiple spatial resolutions and basins we aim to answer the guiding question.

Guiding Question

How do catchment and climate characteristics (pre-)determine appropriate spatial modelling resolution for simulating streamflow?







eWaterCycle is a framework in which hydrological modelers can, for example, compare and analyze the results of models that use different sources of meteorological data. The goal of eWaterCycle is to advance the state of FAIR (Findable, Accessible, Interoperable, and Reusable) and open science in hydrological modeling.



The experiment runs in a Jupyter notebook, the model runs in a container, in any programming language, communicating through grpc4bmi, developed in our team.



About eWaterCycle

