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It's impolite to zoom in on global hydrological models

Jerom Aerts[1], Albrecht Weerts[2,3], Willem van Verseveld[2], Niels Drost[4], Rolf Hut[1], and Nick van de Giesen[1]

[1]Water Management, Delft University of Technology, Delft, The Netherlands
[2]Deltares, Delft, The Netherlands
[3]Hydrology and Quantitative Water Management Group, Wageningen University and Research, The Netherlands
[4]Netherlands eScience Center, Amsterdam, The Netherlands

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) that raise questions about how these models can be adjusted in order to take advantage of the finer modelling grid.

In this study, we carry out an extensive assessment of how changes in spatial resolution affect the simulations of the Wflow SBM model for 8 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 discharge, snow extent, soil moisture, and actual evaporation. In addition, we make use of two sets of parameters that rely on different pedo-transfer functions. Further investigating the role parameterization in conjunction with changes in spatial resolution.

By carrying out this study within the eWaterCycle II framework we showcase our ability to handle large datasets (forcing and validation) whilst always complying to the FAIR principles. Furthermore, this study is setup in such that it is scalable in terms of case study areas and hydrological models.