

EGU21-125

<https://doi.org/10.5194/egusphere-egu21-125>

EGU General Assembly 2021

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## On the influence and limitations of hyper-resolution hydrological modelling – application of the 1 km PCR-GLOBWB model over Europe

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Developing and applying hyper-resolution models over larger extents has long been a quest in hydrological sciences. With the recent developments of global-scale yet fine data sets and advances in computational power, achieving this goal becomes increasingly feasible.

We here present the development, application, and results of the novel 1 km version of PCR-GLOBWB for the period 1981 until 2020. Even though employing global data sets only, we developed, ran, and evaluated the 1 km model for the continent Europe only. In comparison to past versions of PCR-GLOBWB, input data was replaced with sufficiently fine data, for example the recent SoilGrids and MERIT-DEM data. Preliminary results indicate an improvement of model outcome when evaluating simulated discharge, evaporation, and terrestrial water storage.

Additionally, we aim to answer the question to what extent developing hyper-resolution models is actually needed of whether the run times could be saved by using hyper-resolution state-of-the-art meteorological forcing. Therefore, the relative importance of model resolution and forcing resolution was cross-compared. To that end, the ERA5-Land data set was employed at different resolutions, matching the model resolutions at 1 km, 10 km, and 50 km.

Despite multiple challenges still lying ahead before achieve true hyper-resolution, this application of a 1 km model across an entire continent can form the basis for the next steps to be taken.