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Evaluating hyper-resolution global hydrology by comparing multi-model spatial and temporal resolutions

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In this study we investigate the scaling issues that hydrological models face when moving from global scale to hyper-resolution (5 arc minutes or less). In recent years the global hydrological modelling community has made an effort to move towards so called hyper-resolution modelling. The discussions following the move revealed that in addition to the many benefits, e.g. applicability for stakeholders, there are multiple challenges (Wood et al., 2011; Beven and Cloke, 2012; Bierkens et al., 2015). The challenges consist of scaling issues that require explicit spatial modelling of therefore parameterized processes, the need for lateral connections between compartments of the hydrological system and an increase in uncertainty due to lacking process and parameter knowledge that stem from insufficient data quality.

In addition to spatial scaling issues, the HESS opinion article “The need for process-based evaluation of large-domain hyper resolution models” by Melsen et al., (2016) advocates that users of global hydrological models should use appropriate temporal resolutions when modelling at a higher spatial resolution in order to properly represent the hydrological processes that take place.

By using, among other models, the PCRGLOB-WB 2.0 hydrological model (Sutanudjaja et al., 2018) we compare and investigate the representation of hydrological processes at different spatial and temporal resolutions. In doing so we showcase the newly developed eWaterCycle II platform that allows for fast and efficient comparative work whilst following the scientific FAIR principles (Wilkinson et al., 2016).