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Global, continental and regional water balance estimates from HYPE catchment modelling

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In the past, catchment modelling mainly focused on simulating the lumped hydrological cycle at local to regional domains with high precision in a specific point of a river. Today, the level of maturity in hydrological process descriptions, input data and methods for parameter constraints makes it possible to apply these models also for multi-basins over large domains, still using the catchment modellers approach with high demands on agreement with observed data.

HYPE is a process-oriented, semi-distributed and open-source model concept that is developed and used operationally in Sweden since a decade. Its finest calculation unit is hydrological response units (HRUs) in a catchment and these are assumed to give the same rainfall-runoff response. HRUs are normally made up of similar land cover and management, combined with soil type or elevation. Water divides are retrieved from topography and calculations are integrated for catchments, which can be of different spatial resolution and are coupled along the river network. In each catchment, HYPE calculates the water balance of a given time-step separately for various hydrological storages, such glaciers, active soil, groundwater, river channels, wetlands, floodplains, and lakes. The model is calibrated in a step-wise manner (following the water path-ways) against various sources additional data sources, including in-situ observations, Earth Observation products, soft information and expert judgements (Arheimer et al., 2012; Donnelly et al, 2016; Pechlivanidis and Arheimer 2015).

Both the HYPE code and the model set-ups (i.e. input data and parameter values) are frequently released in new versions as they are continuously improved and updated. This presentation will show the results of aggregated water-balance components over large domains, such as the Arctic basin, the European continent, the Indian subcontinent and the Niger River basin. These can easily be compared to results from other kind of large-scale modelling approaches. The presentation will also show model performance vs observed data from river gauges and other data sources at local and regional scale. Finally, the results will be compared to a first model run of a world-wide HYPE covering all earth surfaces except from the Antarctic. The World-Wide HYPE has a resolution for calculation and evaluation of on average <1000 km2.

References:

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