The global freshwater availability and water use model WaterGAP 2.2d

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WaterGAP 2.2d

- Water use and availability model
- 0.5°x0.5°
- Global land area (w/o Antarctica)
- WATCH-CRU-land/ocean mask
- In development since 1996

Fig. 1 The WaterGAP 2 framework with its water use models and the linking module GWSWUSE that provides net water abstraction from groundwater and surface water as input to the WaterGAP Global Hydrology Model (WGHM).

Some new features in WaterGAP 2.2d:
- Integration of the historical irrigation dataset (Siebert et al., 2015) in the global irrigation model
- Updated soil water capacity input (Batjes 2012)
- Update of reservoir information and implementing reservoir commissioning years
- New storage-based river velocity algorithm
- Improving soil moisture calculation in semi-arid/ariid regions by keeping the calculated groundwater recharge in the soil if specific precipitation threshold is not reached (before it was handled as runoff)
- Improved naturalized runs (disentangling reservoir and human water use effects)
- Reducing the water balance error to 1*10^-3 km³ yr^-1

Calibration

CS1: adjust parameter γ in the limits of [0.1-5] to match Q_obs within ±10%.
CS2: as CS1, but within ±10%.
CS3: as CS2 but apply area correction factor (adjusts runoff of each grid cell in a range of [0.5-1.5]) to match Q_obs within ±10%.
CS4: as CS3 but apply the station correction factor CS (multiplies Q at the location of the gauging station by a factor without value limitation) to match Q_obs within ±10%.

Fig. 2 Schematic of WGHM in WaterGAP 2.2d. Boxes represent water storage compartments, arrows represent water fluxes. Green (red) colour indicates processes that occur only in grid cells with humid (semi-arid/arid) climate.

Results I

Fig. 3 Results of WaterGAP 2.2d calibration to WFD/WFDEI-GPCC climate forcing with a) calibration status, b) calibration parameter γ, c) area correction factor CS, d) station correction factor CS. Grey areas in d) indicate regions with regionalized calibration parameter.

Results II

Fig. 4 Water resources assessment 1981-2010 under naturalized conditions. Focused groundwater recharge (d) occurs only in semi-arid/arid grid cells and below lakes, wetlands or reservoirs.

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