Supplement of Hydrol. Earth Syst. Sci., 22, 2117–2133, 2018
https://doi.org/10.5194/hess-22-2117-2018-supplement

Hydrology and Earth System Sciences
Open Access

Supplement of

Reconstruction of global gridded monthly sectoral water withdrawals for 1971–2010 and analysis of their spatiotemporal patterns

Zhongwei Huang et al.

Correspondence to: Mohamad Hejazi (mohamad.hejazi@pnnl.gov)

Supplement material

1. Methods used for generating sectoral water consumption data

Besides the global gridded monthly sectoral water withdrawal data during 1971-2010, sectoral water consumption data were also produced at grid scale and monthly time step and are available online (https://doi.org/10.5281/zenodo.897933). For the irrigation sector, irrigation water consumption was generated by reapplying the correction factor in Eq.(1) to irrigation water consumptions simulated by four GHMs (i.e. WaterGAP, LPJmL , H08, and PCR-GLOBWB):

$$Cir_{i,j,g} = Cir\_sim_{i,j,g} \times f_{m,p} \; ; \qquad \text{(S1)}$$

Where $Cir_{i,j,g}$ is the reconstructed irrigation water consumption for the month *i* of year *j* at grid *g* (m3), and $Cir\_sim_{i,j,g}$ is the irrigation water consumption for the month *i* of year *j* at grid *g* simulated by four GHMs (m3); $f_{m,p}$ is the correction factor calculated in Eq.(1). For the remaining sectors, consumptive water use efficiency (the proportion of water consumption to water withdrawal) was used. Based on the simulation of Flörke et al (2013), consumptive water use efficiencies for electricity generation, domestic and manufacturing sector were calculated at country level, and global consumptive water use efficiencies for livestock and mining adopted the value in the US which was estimated by USGS. Thus, water consumptions by these 5 sectors were calculated by the products of reconstructed water withdrawal data and the consumptive water use efficiencies.

2. Supplement figures

Figure S1. Simulated annual irrigation water withdrawal using each of the following four GHMs (i.e., WaterGAP, H08, LPJmL, and PCR-GLOBWB) in comparison with FAO AQUASTAT data at country level and USGS estimation at state level.

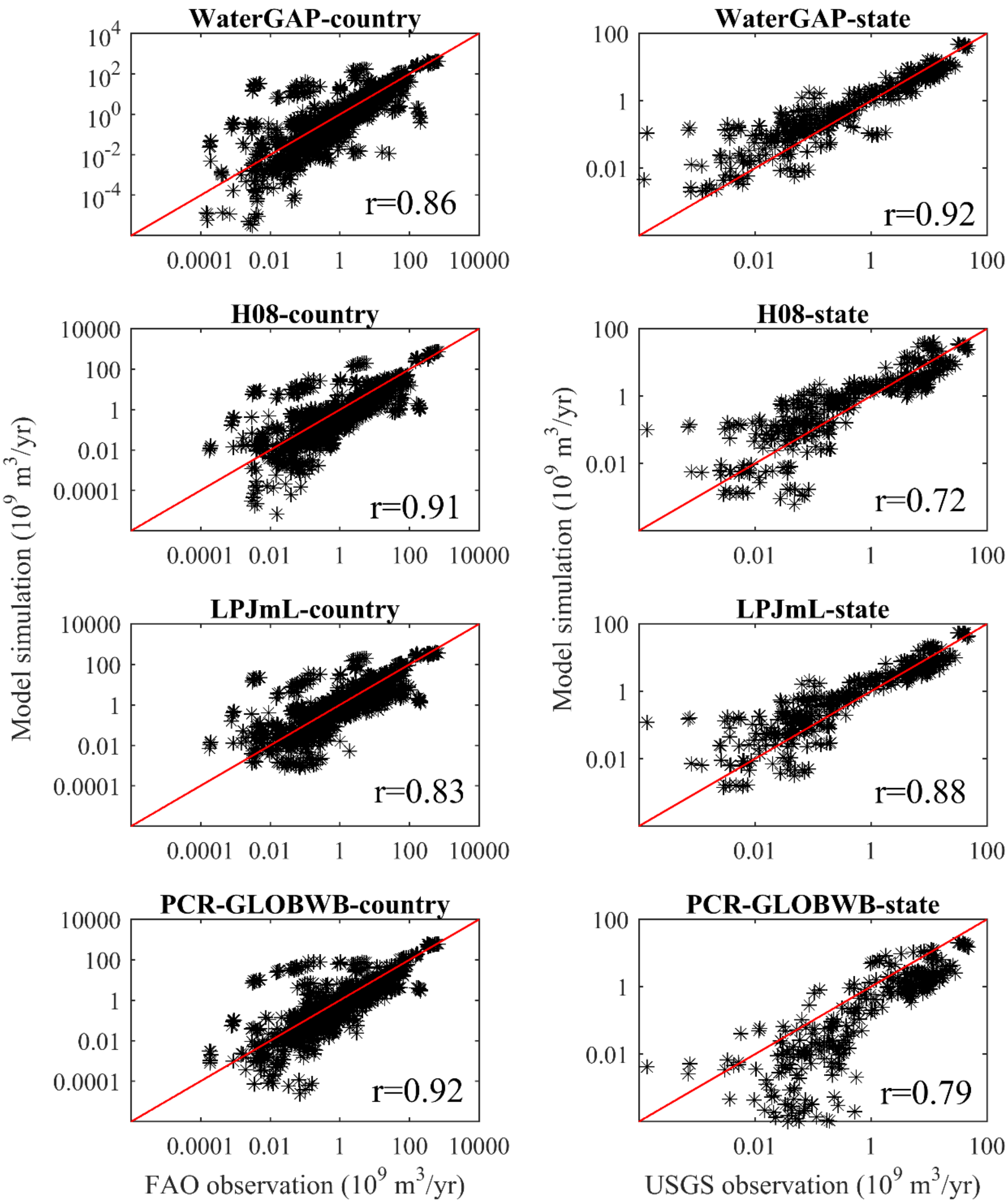

Figure S2. Mean monthly irrigation water withdrawal (normalized in percentage) in 32 GCAM regions simulated by four GHMs (i.e., WaterGAP, H08, LPJmL, and PCR-GLOBWB).

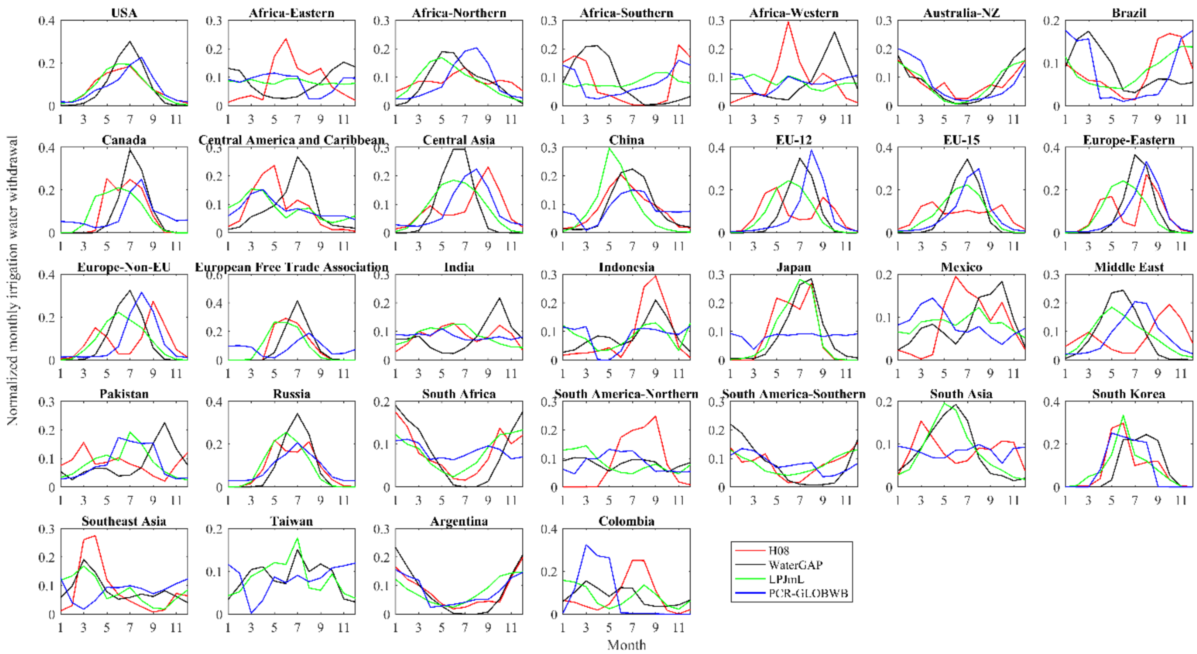

Figure S3. Spatial distribution of global dominant water withdrawal sectors.

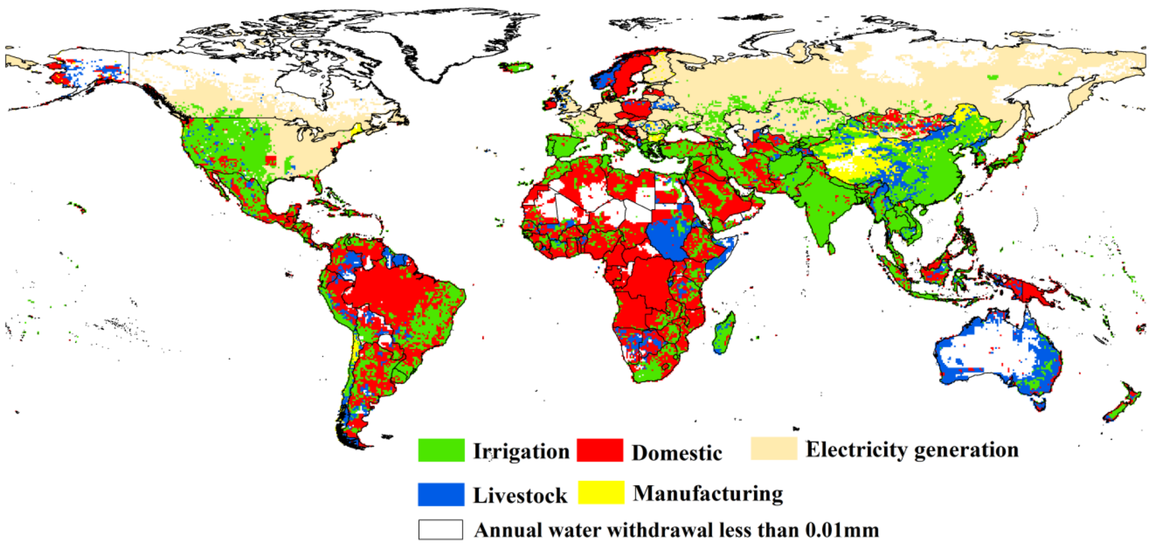

Figure S4. Water withdrawal by 6 sectors during 1971-2010 in (a) Global, (b) China, (c) the US, (d) India and (e) EU27.

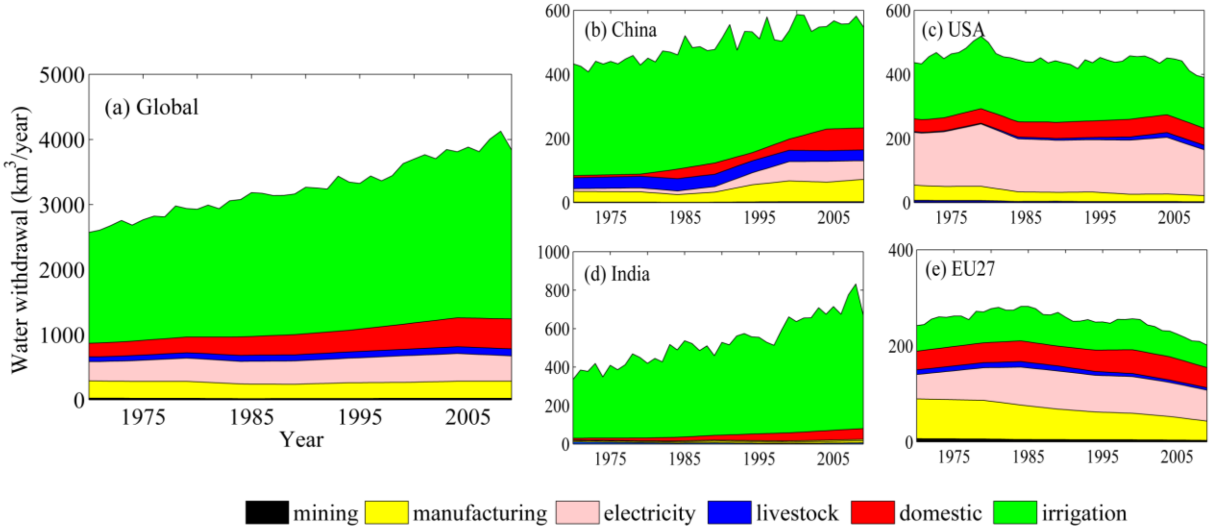

Figure S5 Monthly and annual time-series of total water withdrawal for global, China, the US, India and EU27 during 1971-2010

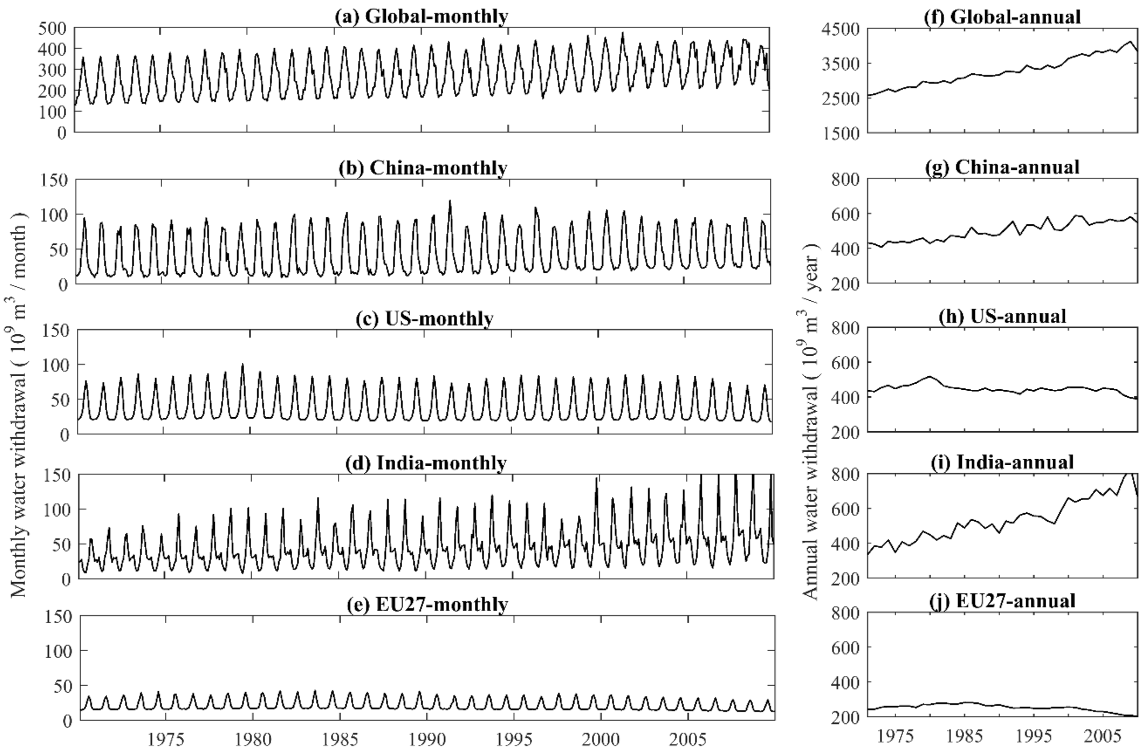

Figure S6. Monthly and annual time-series of irrigation water withdrawal for global, China, US, India and EU27 during 1971-2010.

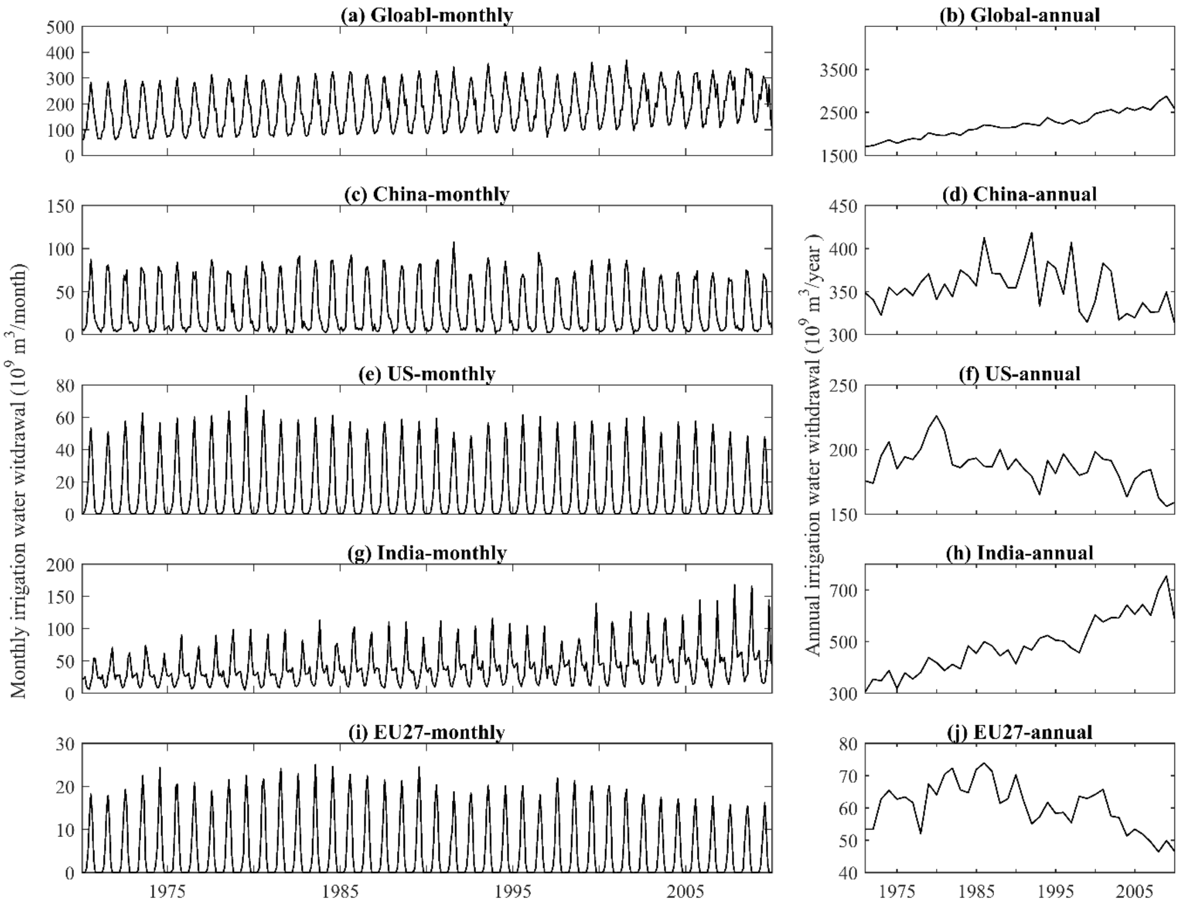

Figure S7. Monthly and annual time-series of domestic water withdrawal for global, China, US, India and EU27 during 1971-2010.

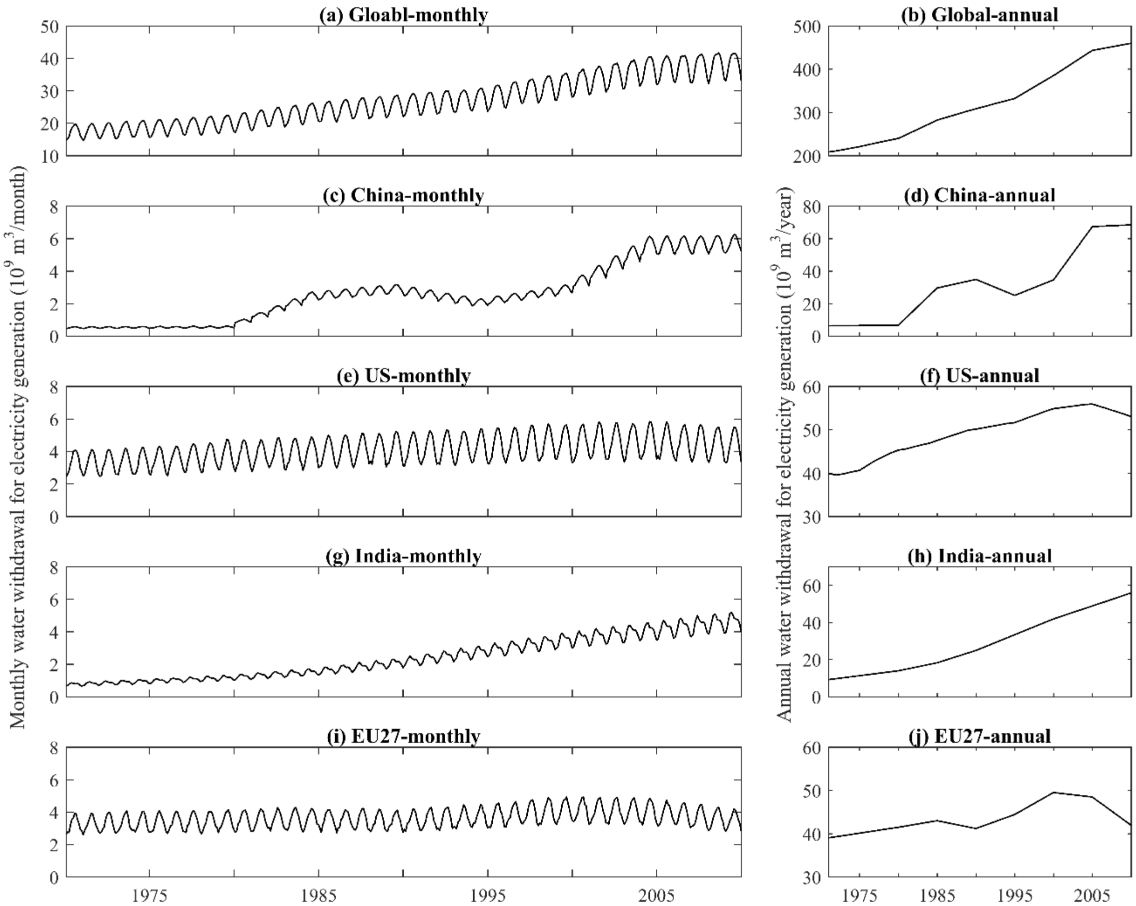

Figure S8 Monthly and annual time-series of electricity generation water withdrawal for global, China, US, India and EU27 during 1971-2010

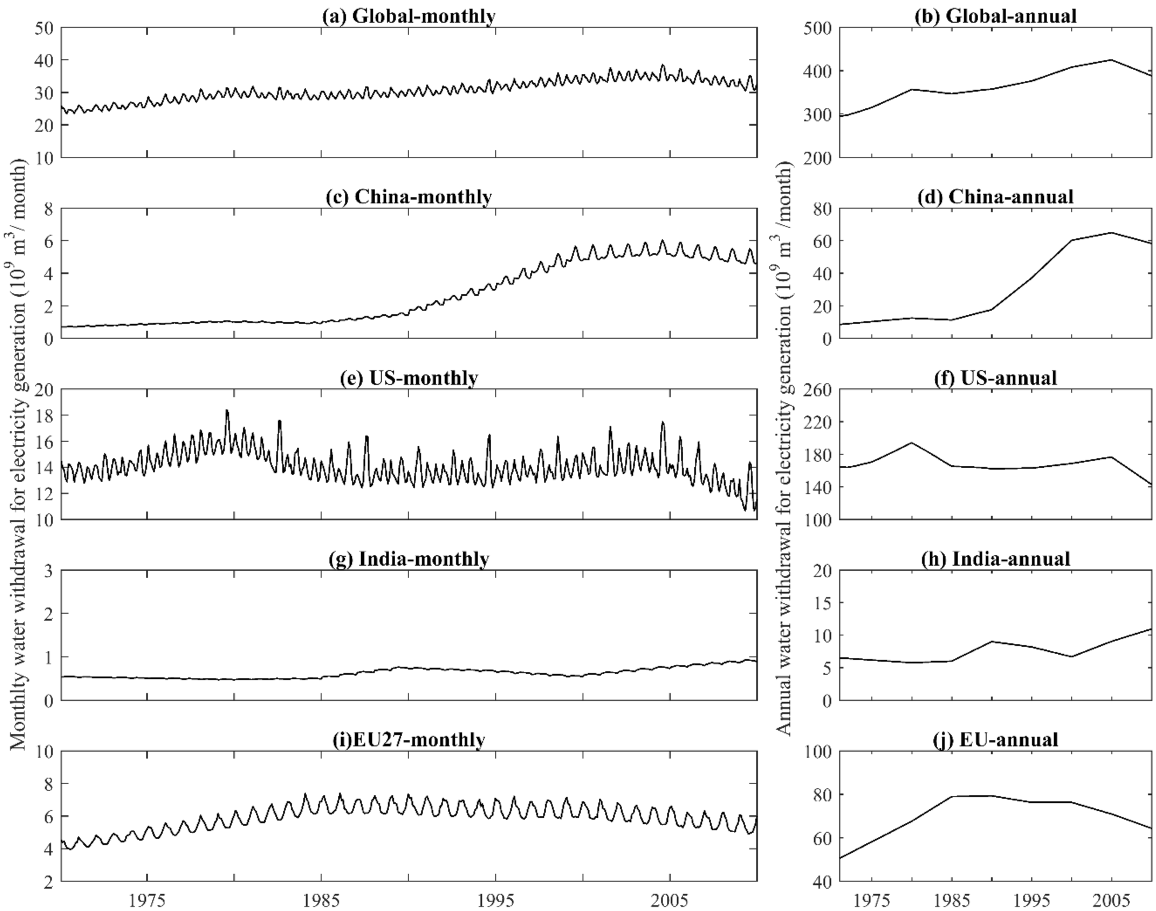

Figure S9. Annual time-series of water withdrawal by sector (mining, livestock, and manufacturing) for global, China, US, India and EU27 during 1971-2010.

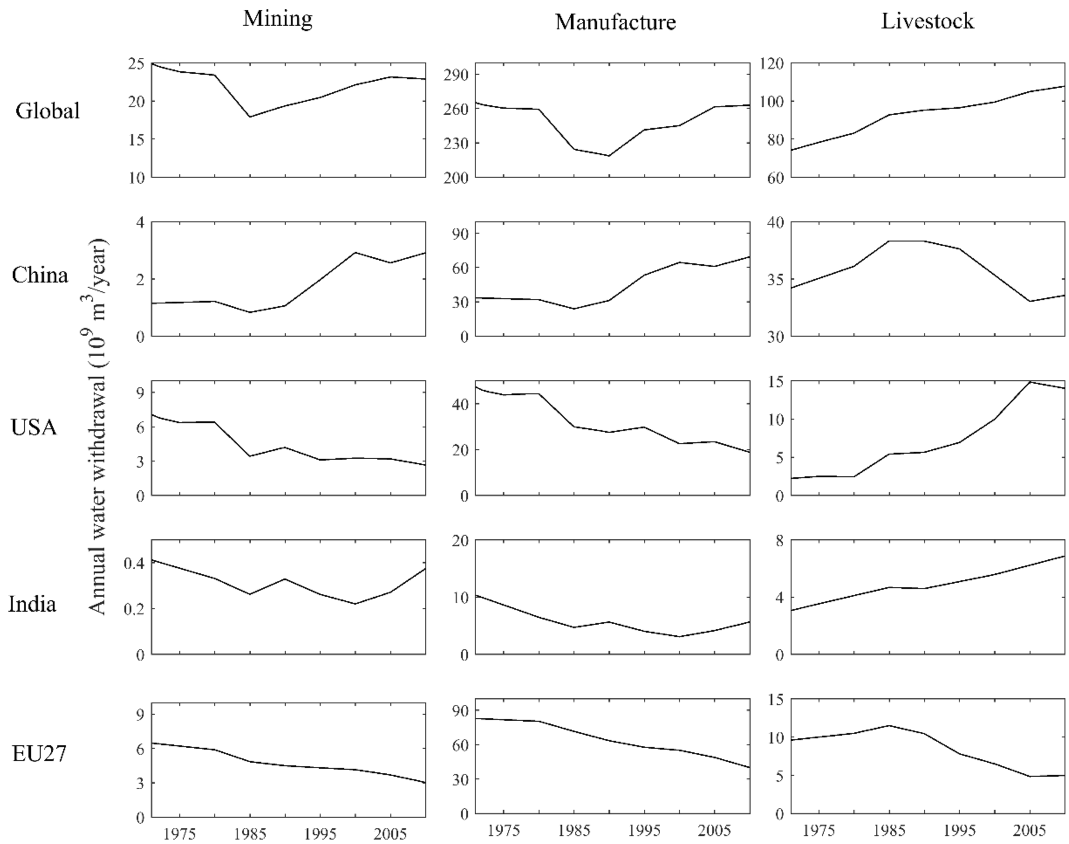

Figure S10 comparison of global water withdrawal used in this study with estimates from Flörke et al. (2013) and Shiklomanov (2000) for domestic and industrial sectors.

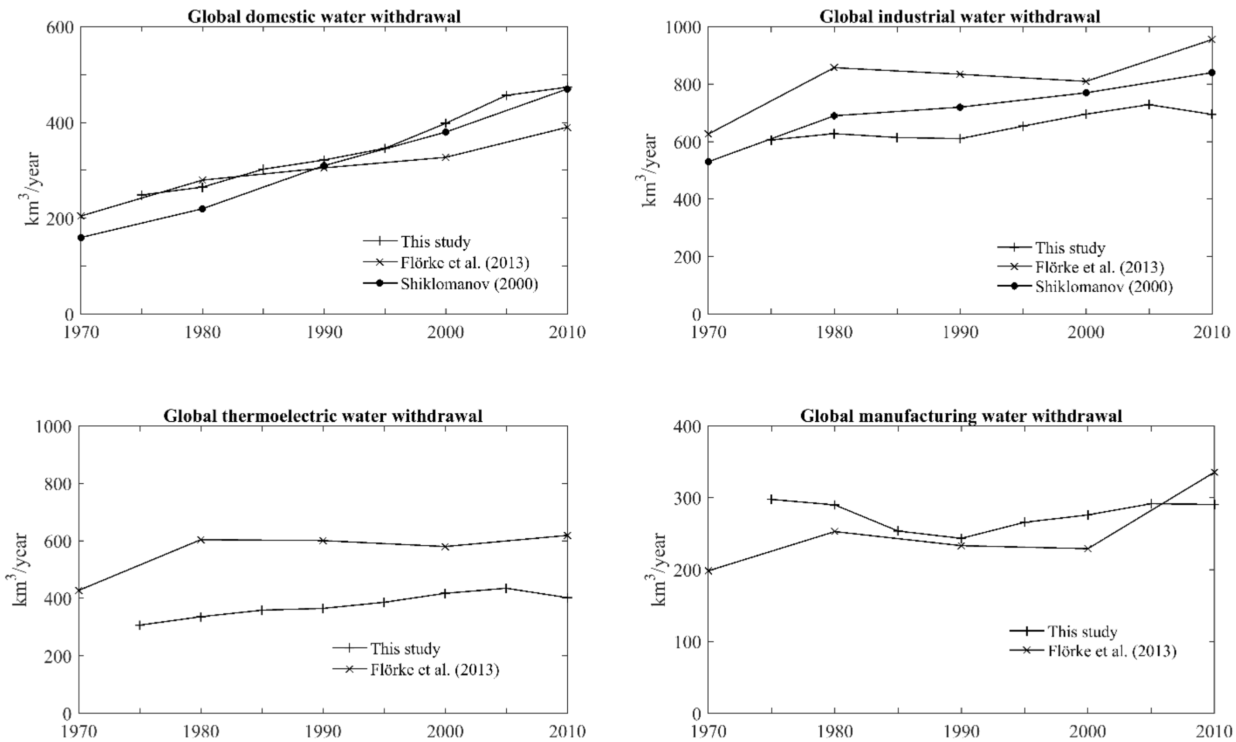

Figure S11 coefficient of variation (CV) of irrigation water withdrawal in JJA and DJF caused by multi-model framework and by multi-forcing data: December to February (DJF) and June to August (JJA).

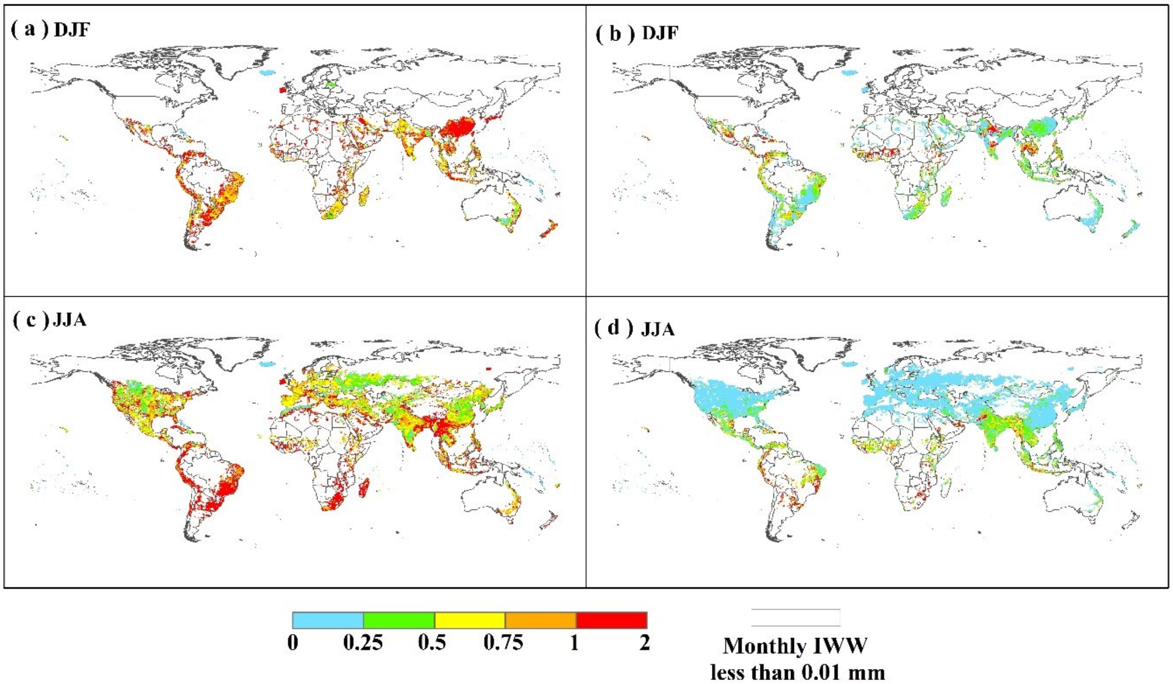

Figure S12 coefficient of variation (CV) caused by different climate forcing in temporal downscaling of (a) domestic and (b) electricity generation in 4 seasons: : December to February (DJF), March to May (MAM), June to August (JJA) and September to November (SON).