Global Streamflow Characteristics Dataset (GSCD)

- Comprises global maps of 17 streamflow characteristics
- Same method as Beck et al. (2013)
- Unique: derived by training neural-network ensembles on a large database of local catchment streamflow observations and spatial predictors.
- Maps including uncertainty estimates
- Freely available for download soon (currently via albert.vandijk@anu.edu.au)
- 0.125◦ grids (WGS 84) in GeoTIFF format: (1) observed, (2) estimated; (3) estimation uncertainty.

Probably useful for diagnosing and parameterizing hydrological behaviour of CABLE:

- Deep drainage
- Surface runoff
- Snow melt
- (future) groundwater dynamics

Local catchments; no routing scheme needed

Beck, H. E., A. I. J. M. van Dijk, D. G. Miralles, R. A. M. de Jeu, L. A. Bruijnzeel, T. R. McVicar, and J. Schellekens (2013). Global patterns in baseflow index and recession based on streamflow observations from 3394 catchments. *Water Resources Research* 49 (12), 7843–7863.

Table 1: The streamflow characteristics included in the GSCD.

Streamflow characteristic	Units	Description
BFI1	–	Baseflow index, defined as ratio of long-term baseflow to total streamflow (Smakhtin, 2001). Computed using the recursive digital filter of Van Dijk (2010).
BFI2	–	Baseflow index, computed using the Hysep local-minimum method (Sloto and Crouse, 1996). The "drainage area" was set to 3125 km^2 for all catchments (i.e., it is assumed that surface runoff ceases after 5 days).
BFI3	–	Baseflow index, computed using a 7-day sliding interval (Pettyjohn and Henning, 1979).
BFI4	–	Baseflow index, computed using the Institute of Hydrology (1980) fixed-interval method.
k	d^{-1}	Baseflow recession constant, defined as the rate of baseflow decay (Vogel and Kroll, 1996). Computed following Van Dijk (2010), with the "window size" set to 5 days and days with zero flow ignored.
Q1–Q99	mm d^{-1}	Daily flow percentiles (non-exceedance probability).
T50	–	The day of the water year marking the timing of the center of mass of streamflow (Stewart et al., 2005). The water year is defined as the 12-month period from October to September in the Northern Hemisphere and April to March in the Southern Hemisphere.
RC	–	Runoff coefficient, the ratio of streamflow to precipitation.
QMEAN	mm yr^{-1}	Mean annual streamflow.

Predictors

(only those ultimately selected by ANNs)

Type	Predictor(s)	Description
Climate	HI (−)	Humidity index
	P (mm yr^{-1})	Mean annual precipitation
	P_{si} (−)	Precipitation seasonality
	PET (mm yr^{-1})	Mean annual potential evaporation
	PET$_{\mathrm{si}}$ (−)	Potential evaporation seasonality
	CORR (−)	Seasonal correlation between water supply and demand
	TA (K)	Mean annual air temperature
	SNOW (mm)	Mean snow-water equivalent depth
Topography	ELEV (m asl)	Mean surface elevation
	SLO (°)	Mean surface slope
Land cover	fW (−)	Fraction of open water
	fTC (−)	Fraction of forest
	NDVI (−)	Mean Normalized Difference Vegetation Index (NDVI)
Geology	PERM (log$_{10}$ m^2)	Mean permeability of consolidated and unconsolidated geologic units below the soil
Soils	GRAV (%)	Mean soil gravel content
	SAND (%)	Mean soil sand content
	SILT (%)	Mean soil silt content
	CLAY (%)	Mean soil clay content

Examples

Mean streamflow

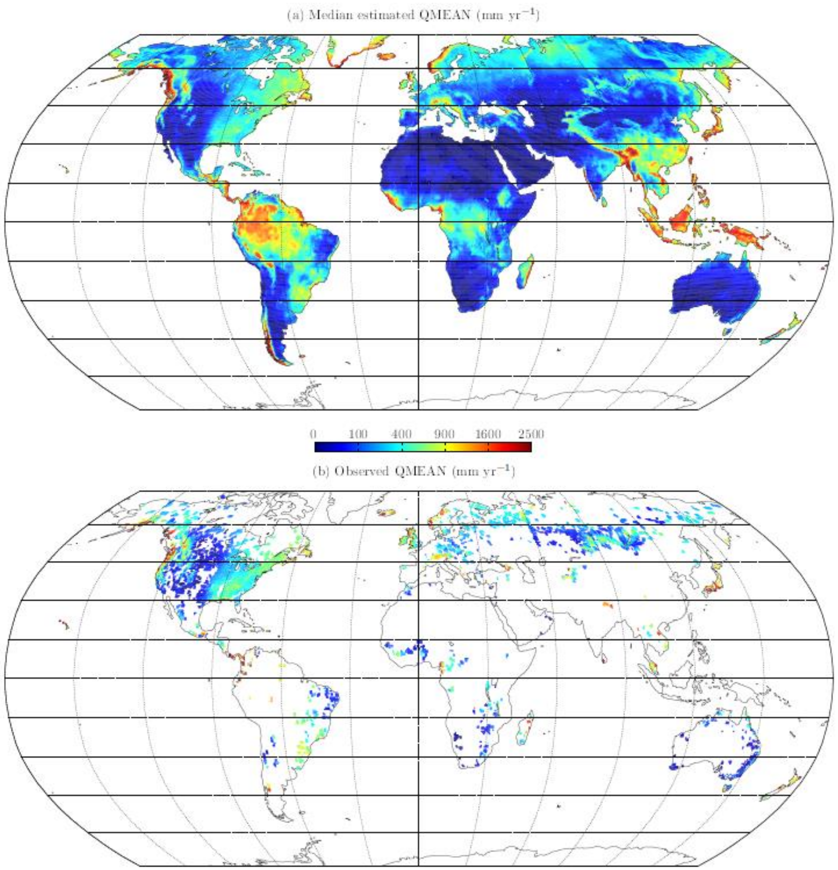

Figure 17: Global maps of (a) median estimated and (b) observed QMEAN. The estimated values in (a) are the back-transformed medians of the ten cross-validation iterations. In (b) only gauged regions are assigned a value.

BFI (fraction streamflow from subsurface)

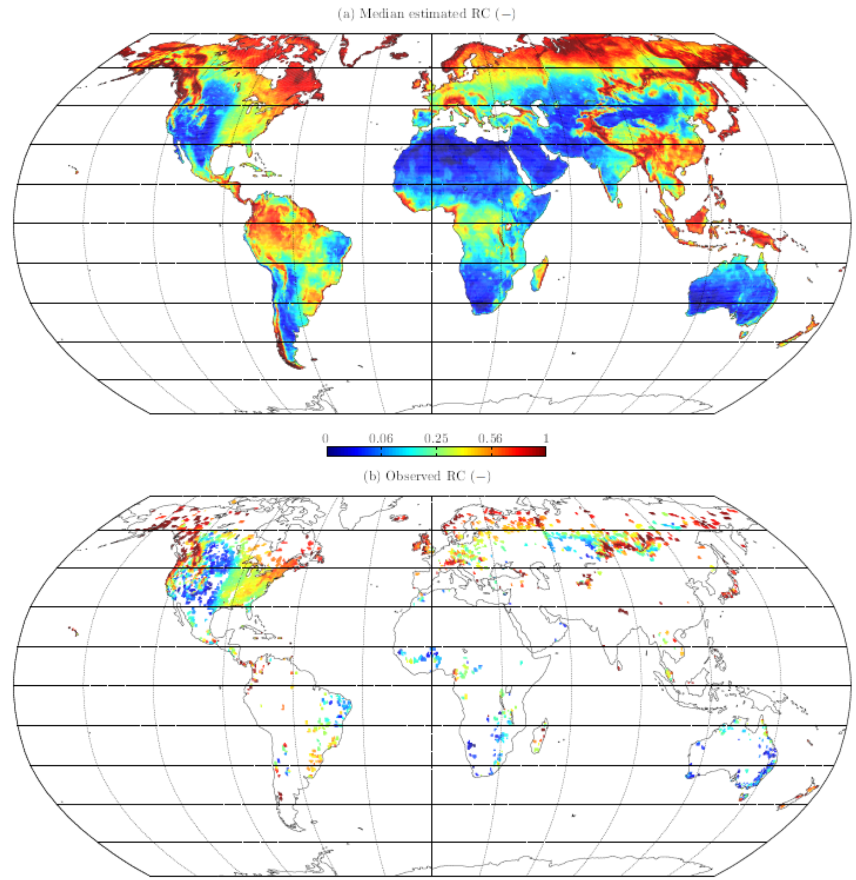

Figure 16: Global maps of (a) median estimated and (b) observed RC. The estimated values in (a) are the back-transformed medians of the ten cross-validation iterations. In (b) only gauged regions are assigned a value.