Supporting Information for

Developing and testing a global-scale regression model to quantify mean annual streamflow

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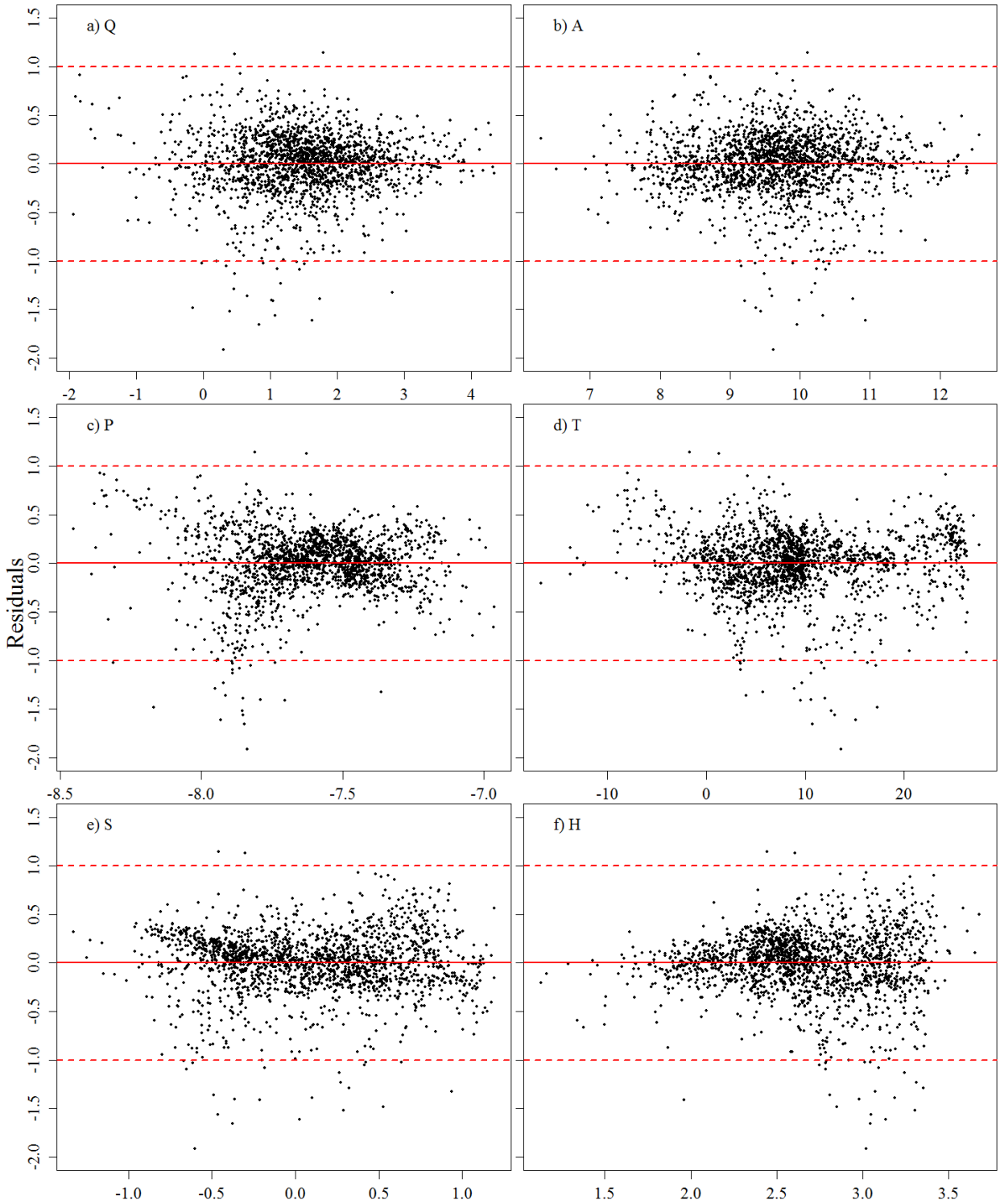

Figure S1. Residuals plot of the regression analysis (MAF 1981-2010) vs a) the response variable mean annual flow Q, b) area of the catchment A, c) 30-years mean precipitation P, d) 30-years mean temperature, e) average slope of the catchment and f) average altitude. The x axes are dimensionless as the variables have been log-transformed, except for temperature which is in °C. Dashed red lines delimit the 1 order magnitude deviation.

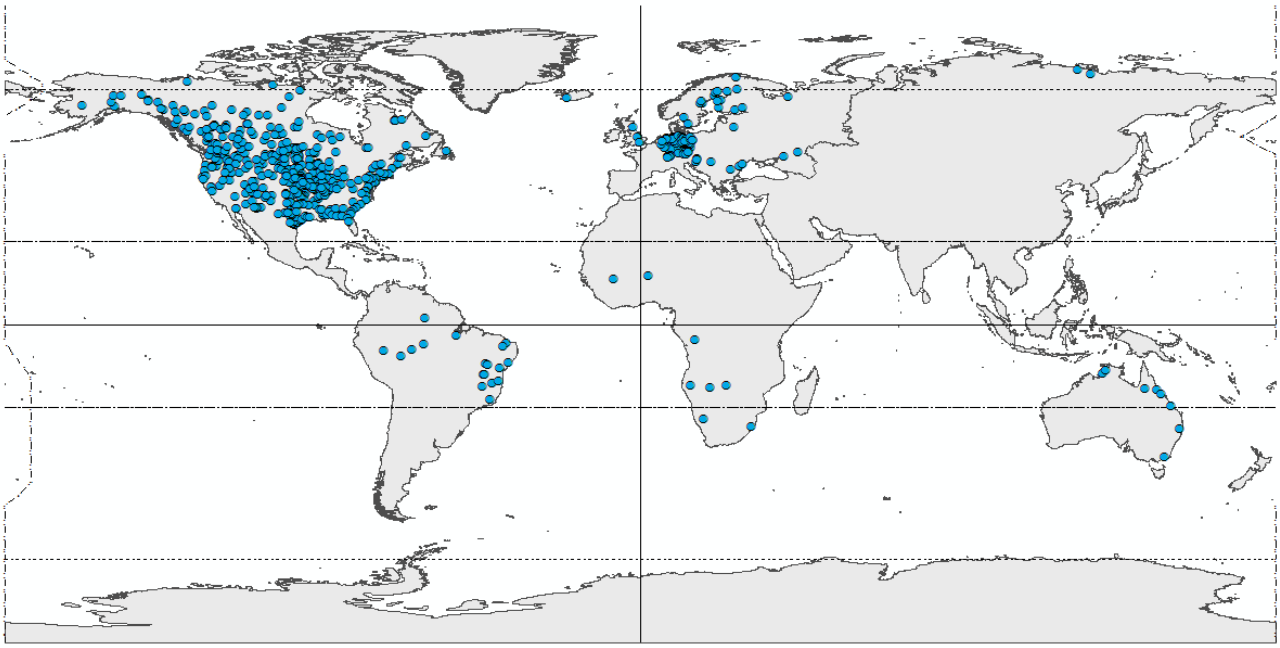

Figure S2. Distribution of the 543 GRDC gauging stations used for performance testing of the MAF model in the backcasting analysis.

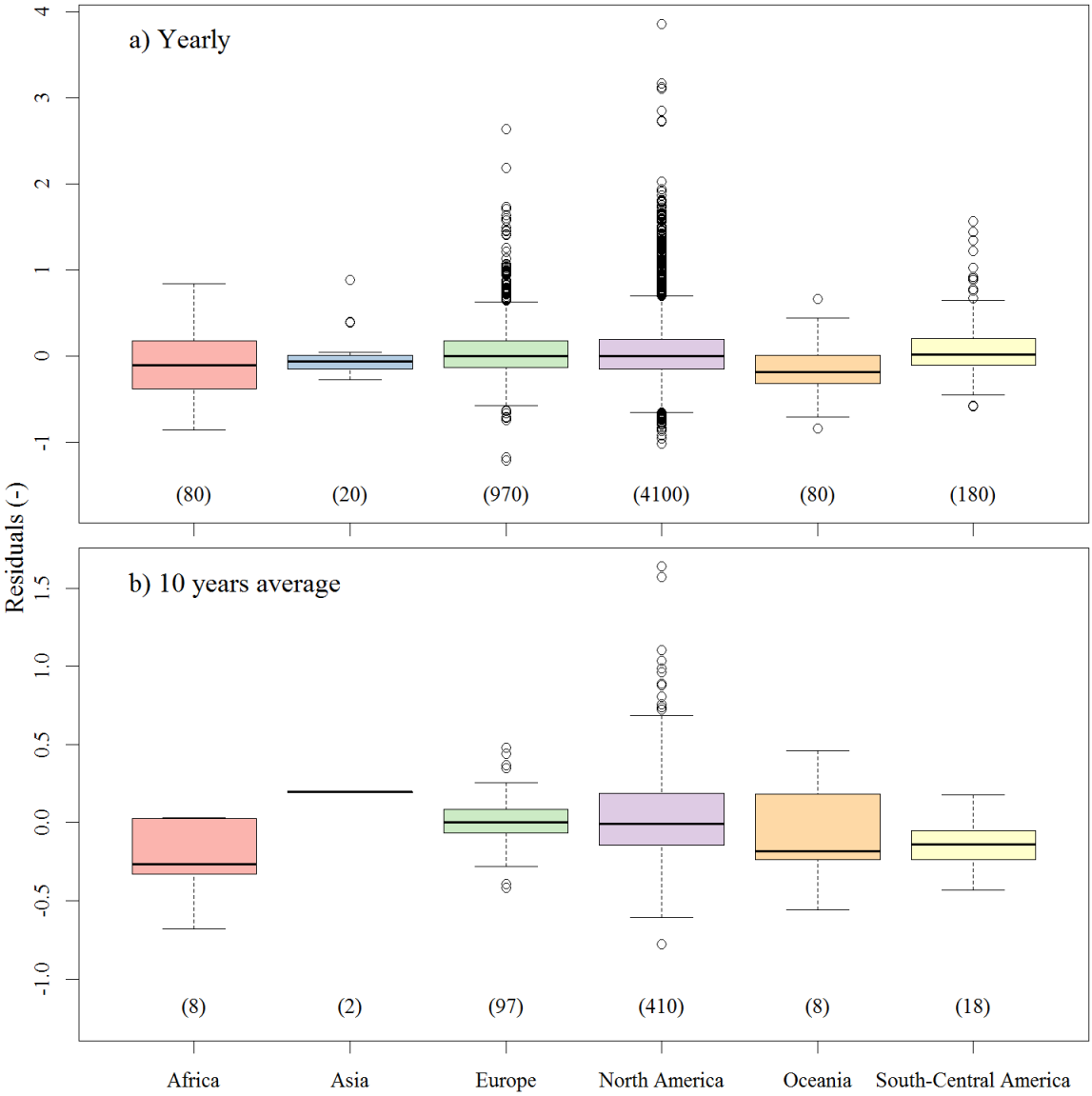

Figure S3. Model residuals per continent of the backcasting analysis for a) the yearly MAF and b) the 10-years averaged MAF values. Residuals are dimensionless as MAF is in base-10 log scale. In brackets the number of observations for each continent.

Table S1. Regression analysis for increasing number of predictors (MAF 1981-2010) based on $Q = 10^{\beta 0} \cdot A^{\beta A} \cdot P^{\beta P} \cdot 10^{\beta T \cdot T} \cdot H^{\beta H} \cdot S^{\beta S}$. R^2: coefficient of determination; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; Int.: intercept.

N. predictors	Int.	A	P	T	S	H	R^2	AIC	BIC
1	-6.505	0.828	-	-	-	-	0.611	3471	3488
2	6.565	0.933	1.850	-	-	-	0.790	2312	2335
3	10.956	0.957	2.411	-0.039	-	-	0.866	1464	1492
4	10.403	0.965	2.354	-0.037	0.184	-	0.874	1345	1378
5	9.066	1.018	2.070	-0.038	0.464	-0.509	0.893	1049	1088
Standardized coefficients									
1	0.000	0.782	-	-	-	-			
2	0.000	0.881	0.434	-	-	-			
3	0.000	0.903	0.566	-0.305	-	-			
4	0.000	0.911	0.553	-0.284	0.094	-			
5	0.000	0.961	0.486	-0.290	0.237	-0.212			

Table S2. Comparison of the coefficients from the spatial error (SE) and OLS regression models. The analysis is based on the subset of observations within 58S-60N latitudes. R^2: coefficient of determination; LM: Lagrange Multiplier test score; m: number of observations.

Variable	SE coeff. (95% CI)	OLS coeff. (95% CI)
λ	0.614 (0.573 – 0.656)	-
Int.	9.900 (9.245 – 10.556)	10.365 (9.778 – 10.952)
A	0.982 (0.965 – 0.999)	0.999 (0.981 – 1.017)
P	2.184 (2.090 – 2.278)	2.268 (2.186 – 2.351)
T	-0.034 (-0.037 – -0.031)	-0.032 (-0.035 – -0.030)
H	-0.396 (-0.466 – -0.327)	-0.386 (-0.446 – -0.327)
S	0.368 (0.313 – 0.422)	0.396 (0.351 – 0.440)
R^2	0.93	0.90
LM	7	465
m	1,748	1,748