Quantification of predictive uncertainty in hydrological modelling by harnessing the wisdom of the crowd: A large-sample experiment at monthly timescale
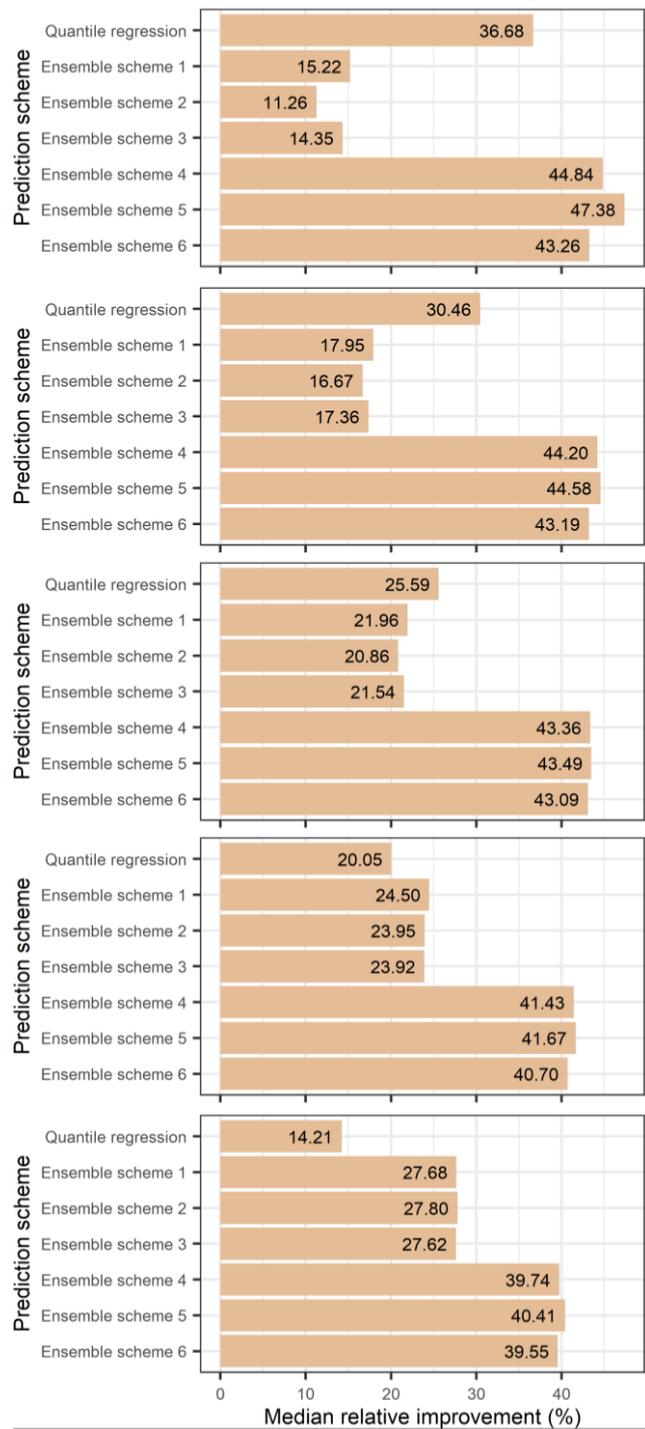
Figure S.1. Median relative improvements in terms of average interval score with respect to the linear regression scheme for the 99%, 97.5%, 95%, 90% and 80% prediction intervals (from top to bottom) delivered by the compared schemes for the period T_3 (years 1975–1999). Each bar summarizes 270 values.
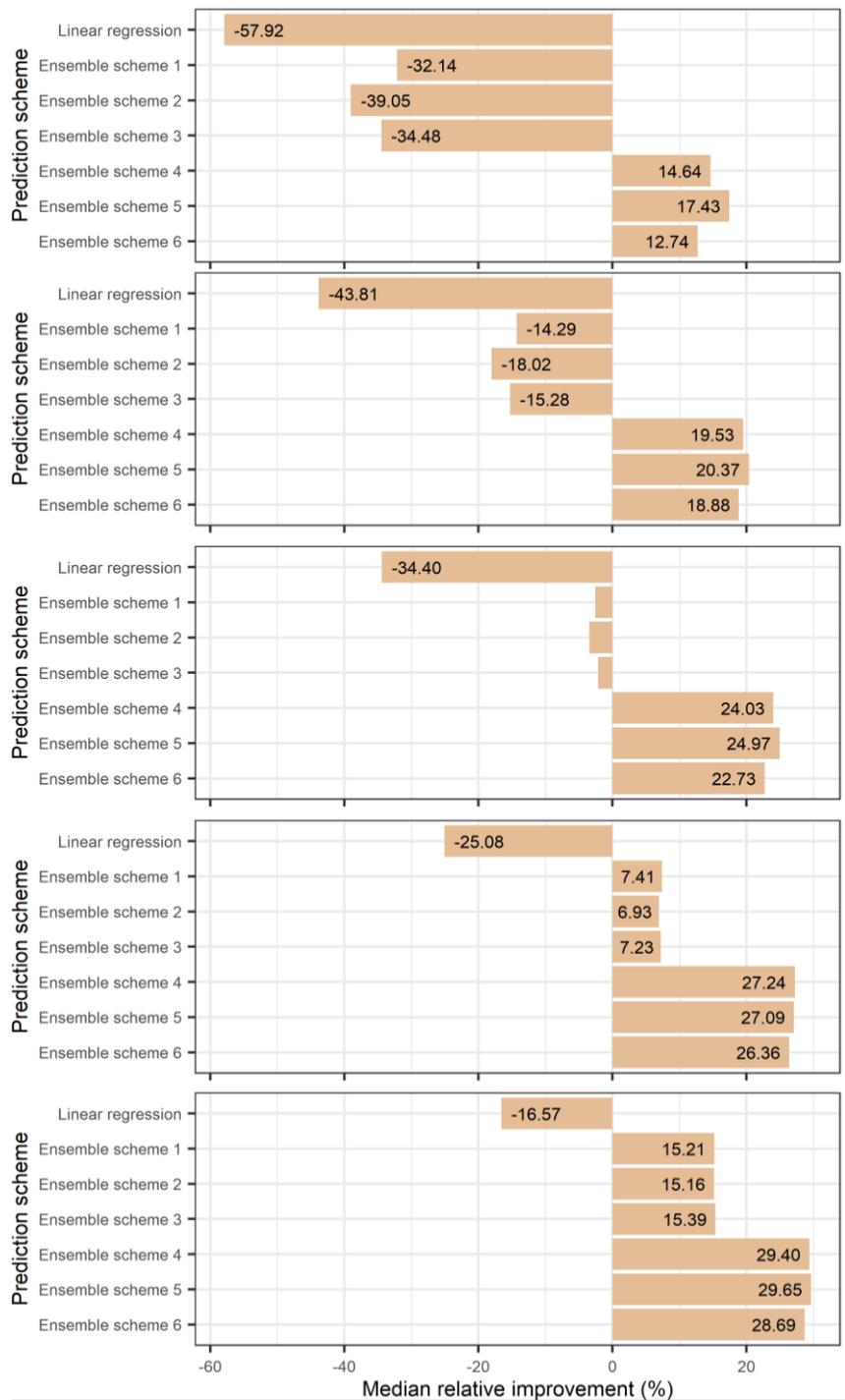
Figure S.2. Median relative improvements in terms of average interval score with respect to the quantile regression scheme for the 99%, 97.5%, 95%, 90% and 80% prediction intervals (from top to bottom) delivered by the compared schemes for the period T_3 (years 1975–1999) Each bar summarizes 270 values.
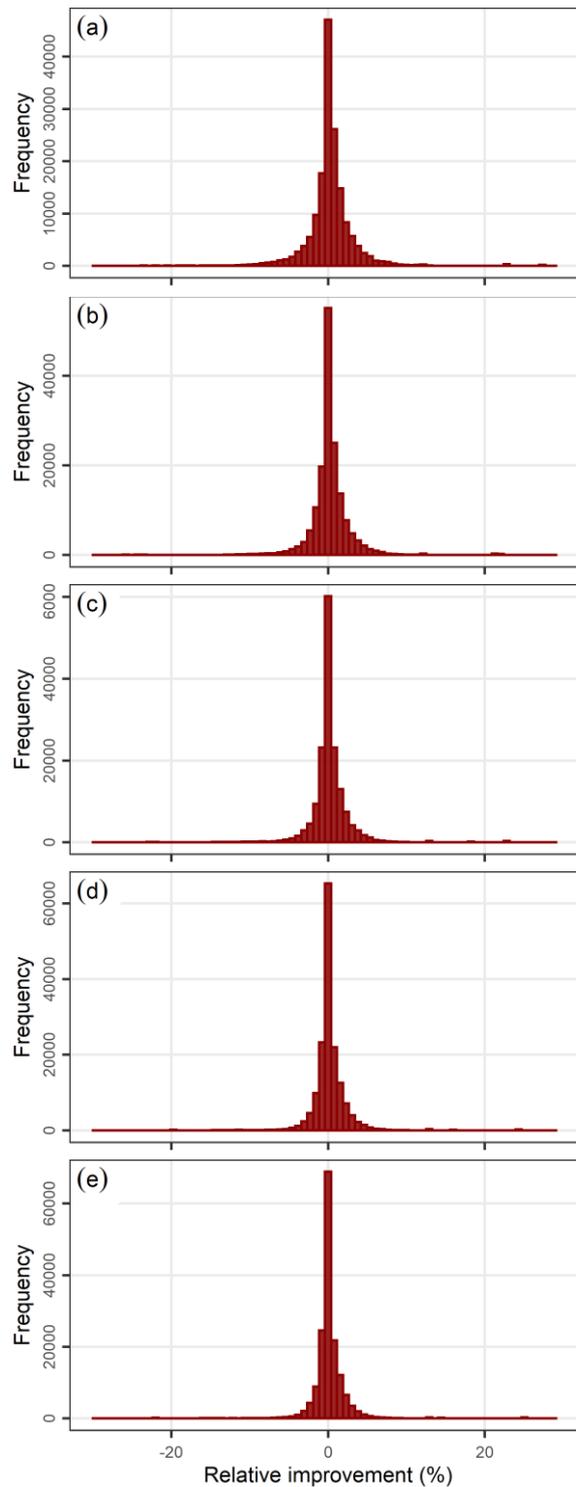
Figure S.3. Relative improvements $\{\mathrm{RI}_{\mathrm{OUT,IN}_i}, i = 1, ..., 600\}$ (defined with Equation 6) for ensemble scheme 1. The relative improvements are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at −30% and 30%. Each histogram summarizes 270 × 600 = 162 000 values.
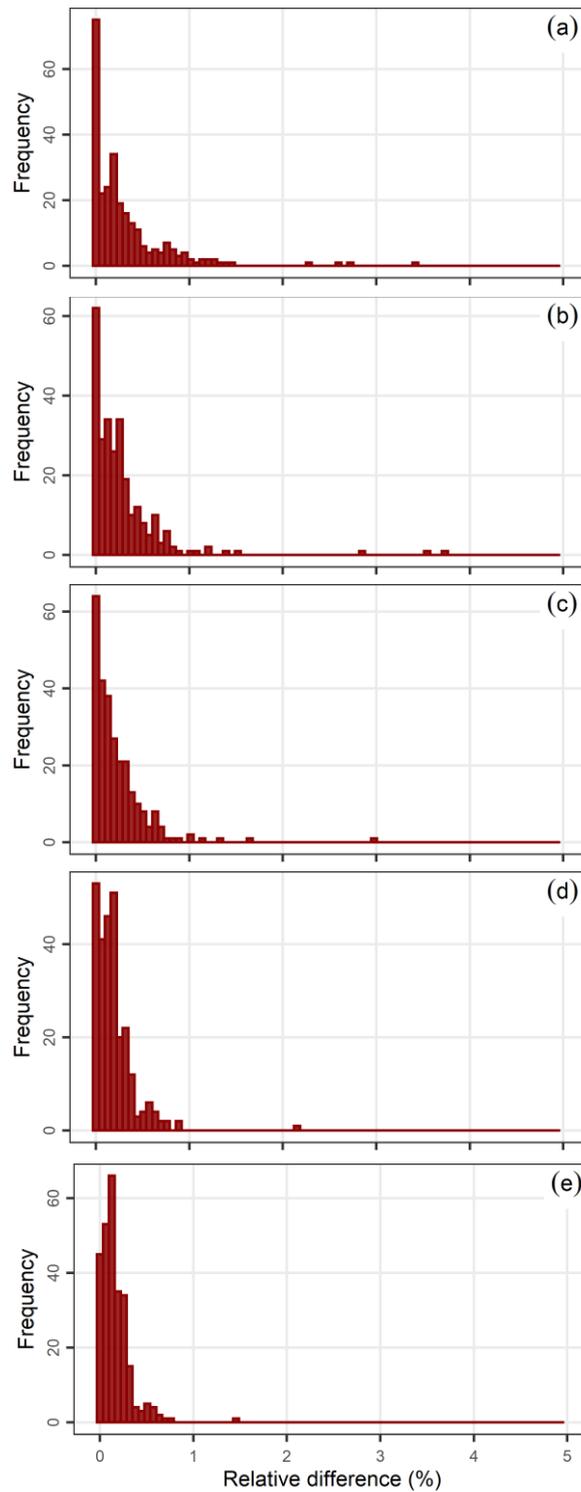
Figure S.4. Relative differences RD$_{OUT,AAIS_{IN}}$ (defined with Equation 8) for ensemble scheme 1. The relative differences are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at 5%. Each histogram summarizes 270 values.
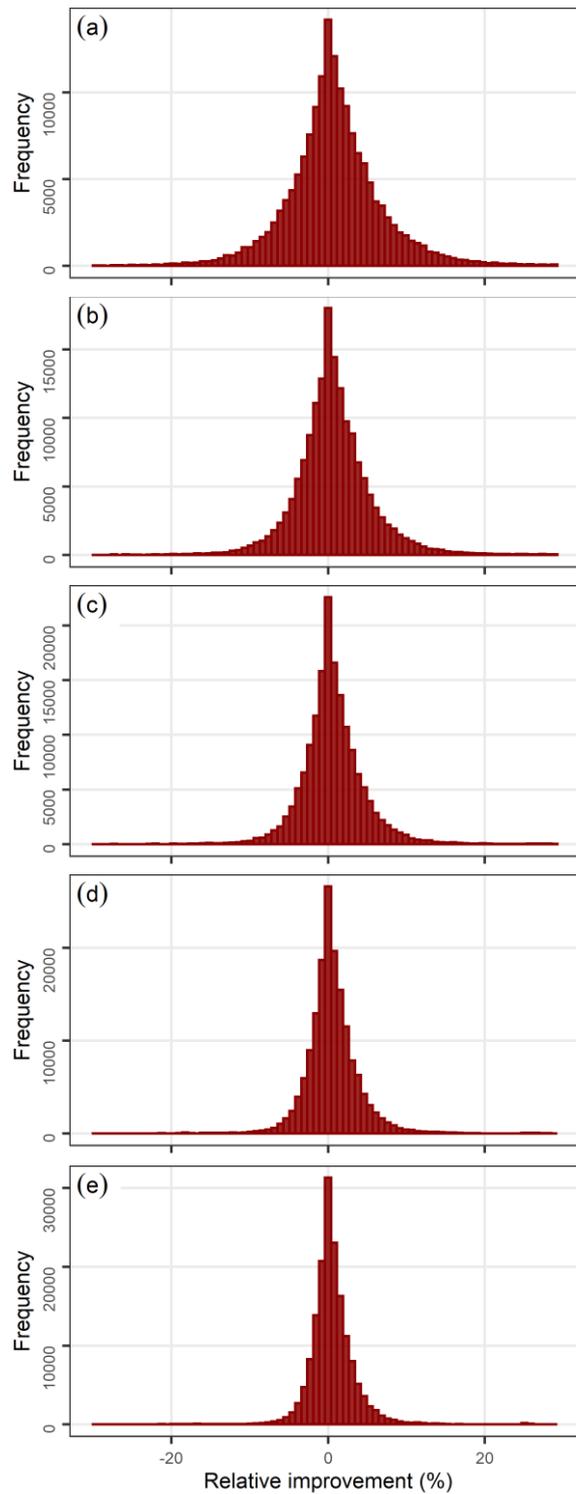
Figure S.5. Relative improvements $\{RI_{OUT,IN_i}, i = 1, …, 600\}$ (defined with Equation 6) for ensemble scheme 2. The relative improvements are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at −30% and 30%. Each histogram summarizes 270 × 600 = 162 000 values.
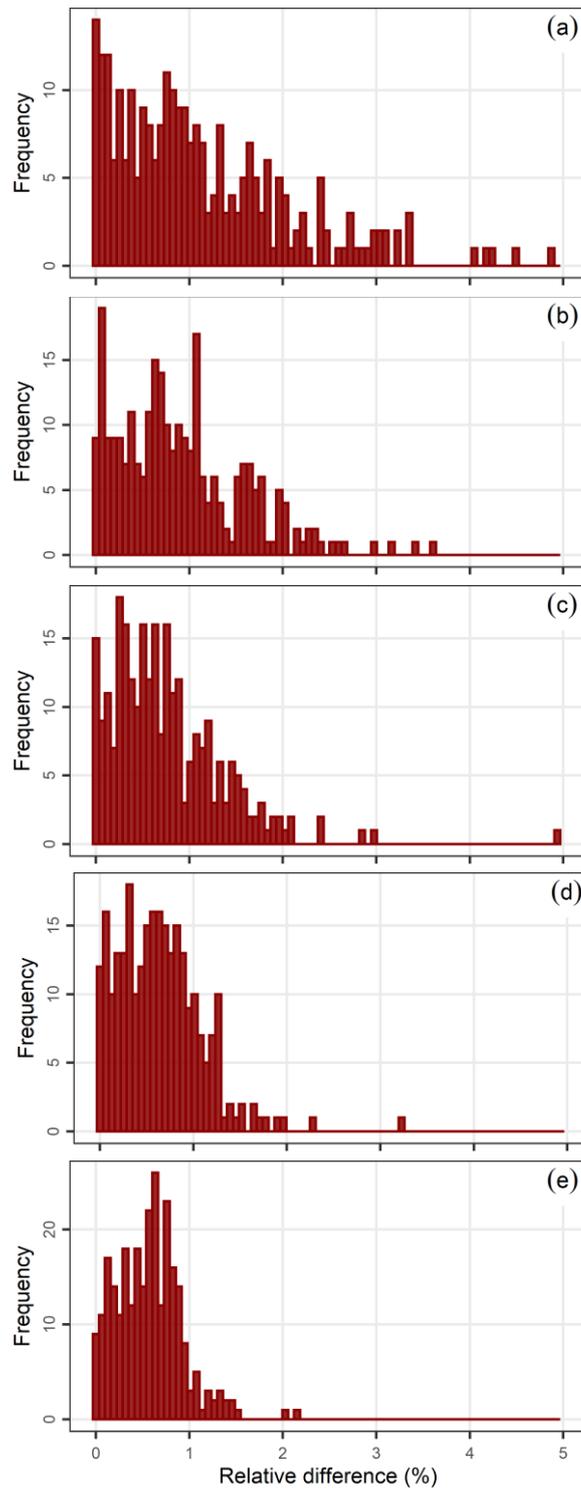
Figure S.6. Relative differences RD$_{\text{OUT,AAIS}_{\text{IN}}}$ (defined with Equation 8) for ensemble scheme 2. The relative differences are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at 5%. Each histogram summarizes 270 values.
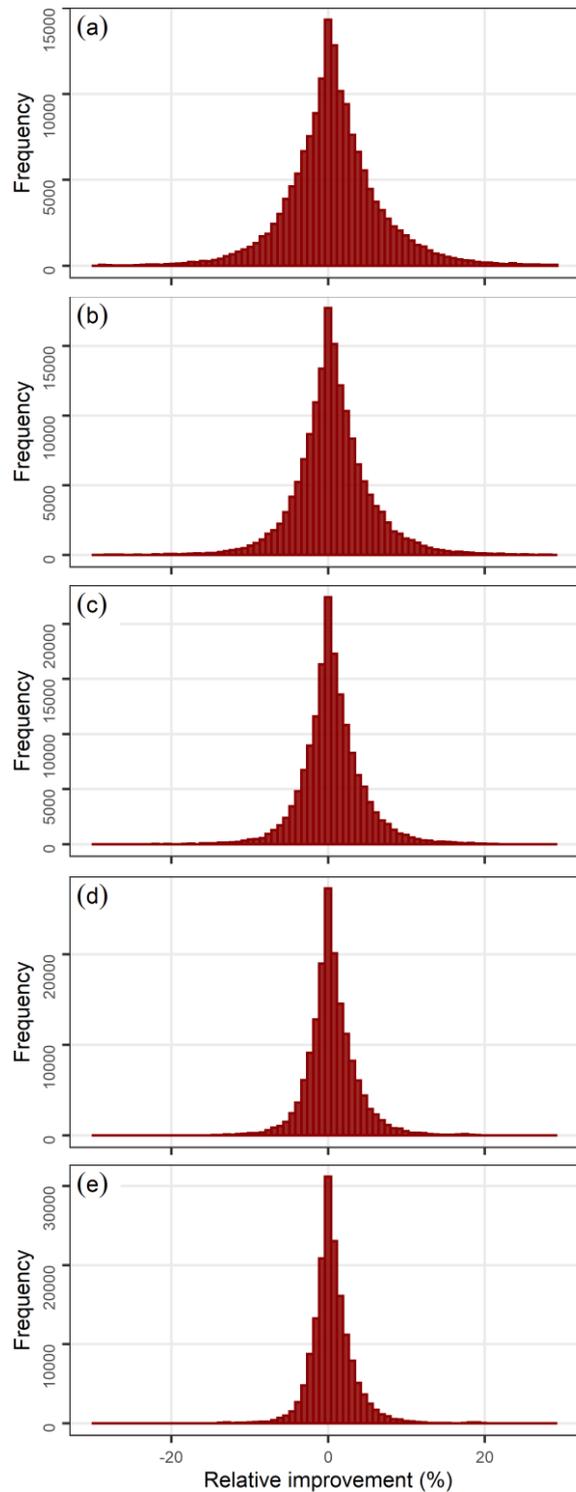
Figure S.7. Relative improvements {$\text{RI}_{\text{OUT,IN}_i}$, $i = 1, ..., 600$} (defined with Equation 6) for ensemble scheme 3. The relative improvements are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at −30% and 30%. Each histogram summarizes 270 × 600 = 162 000 values.
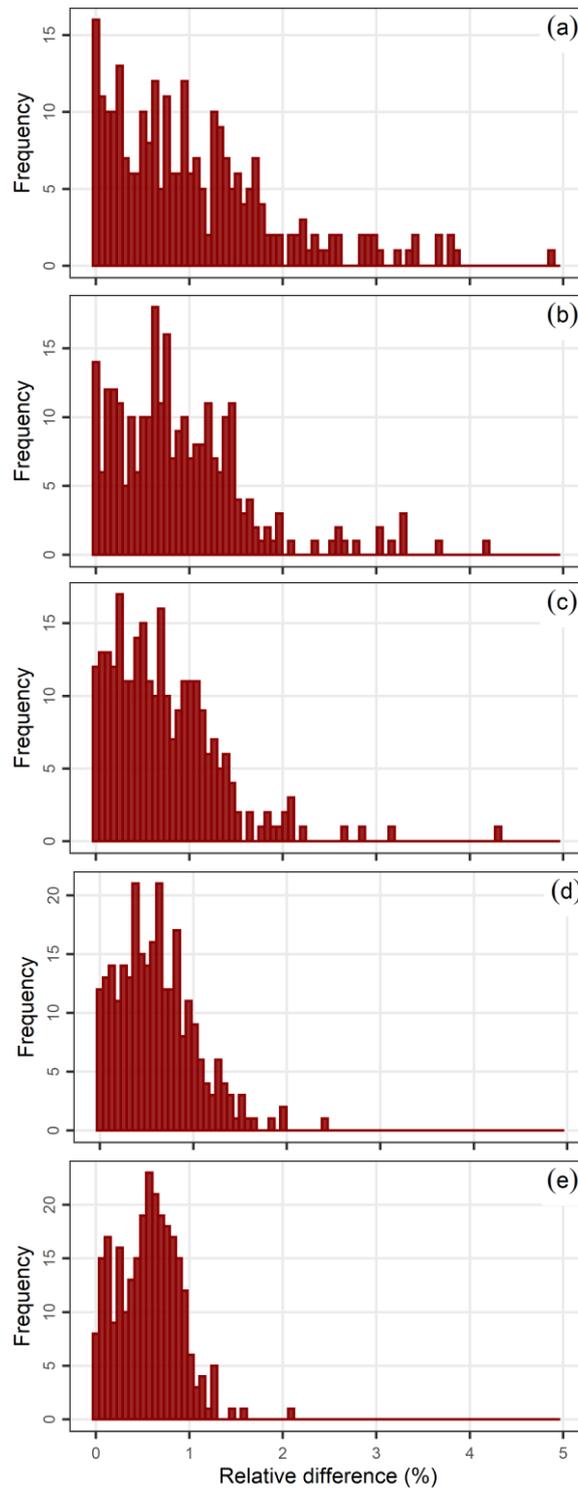
Figure S.8. Relative differences $RD_{OUT,AAIS_{IN}}$ (defined with Equation 8) for ensemble scheme 3. The relative differences are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at 5%. Each histogram summarizes 270 values.
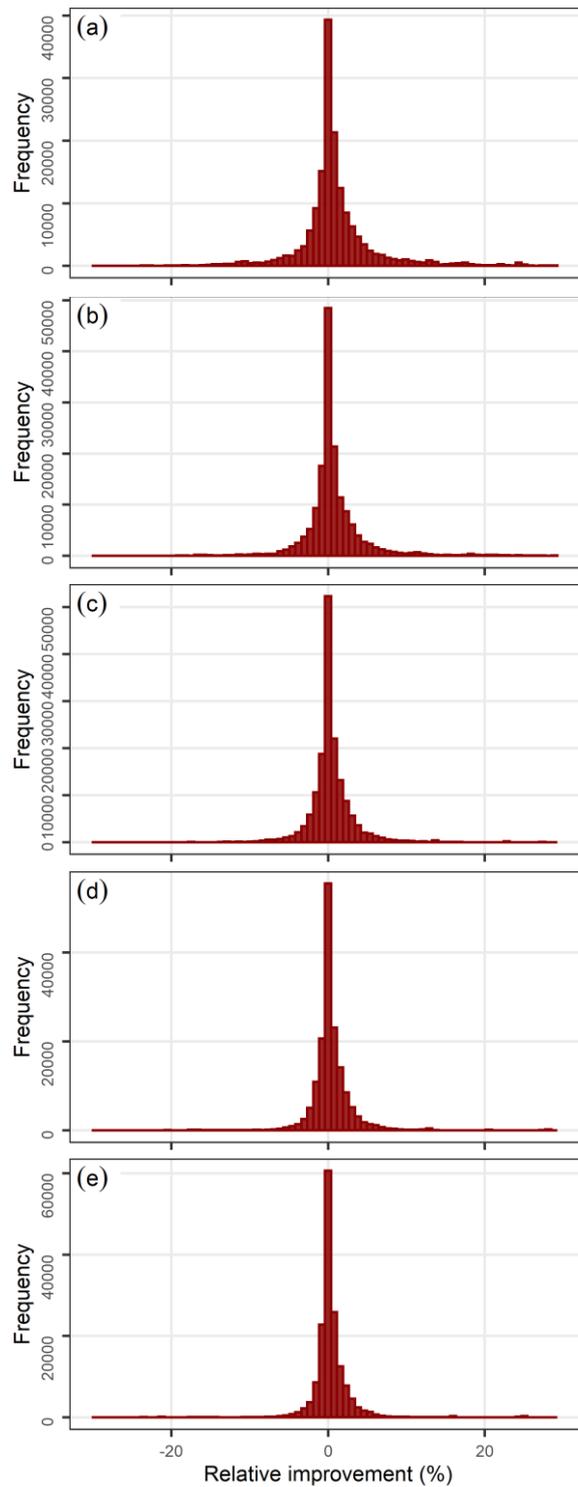
Figure S.9. Relative improvements {RI$_{OUT,IN_i}$, $i = 1, ..., 600$} (defined with Equation 6) for ensemble scheme 4. The relative improvements are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at −30% and 30%. Each histogram summarizes 270 × 600 = 162 000 values.
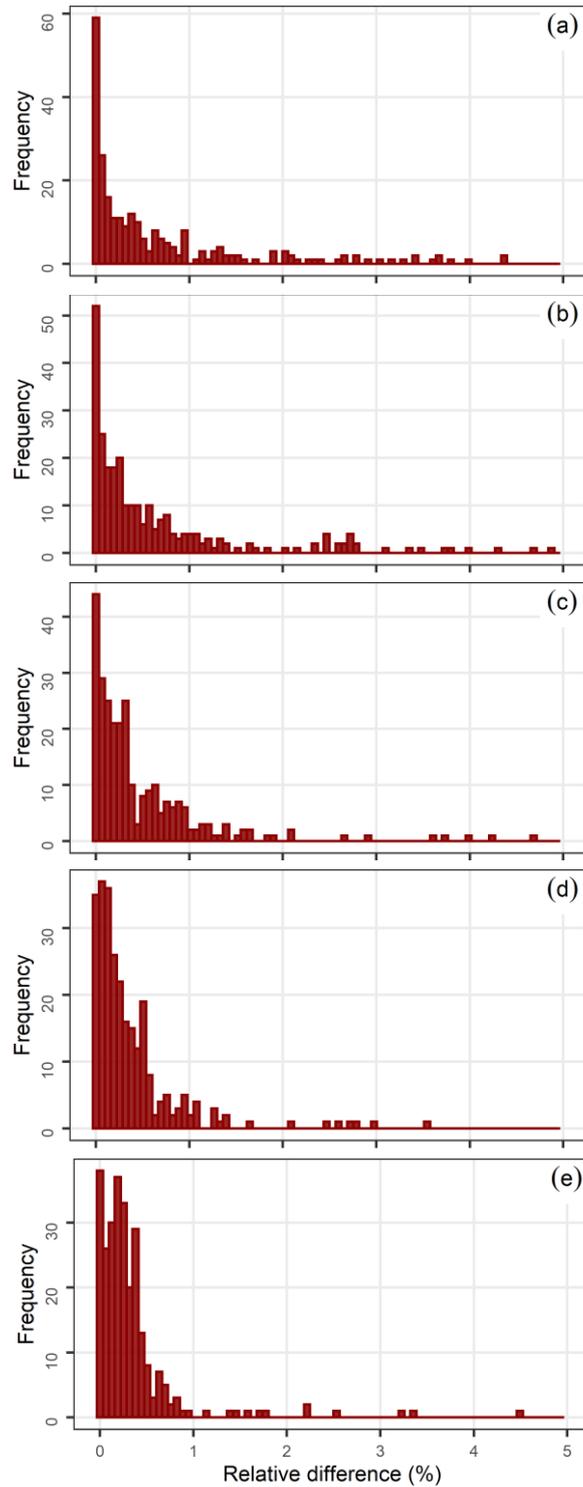
Figure S.10. Relative differences $RD_{OUT,AAIS_{IN}}$ (defined with Equation 8) for ensemble scheme 4. The relative differences are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at 5%. Each histogram summarizes 270 values.
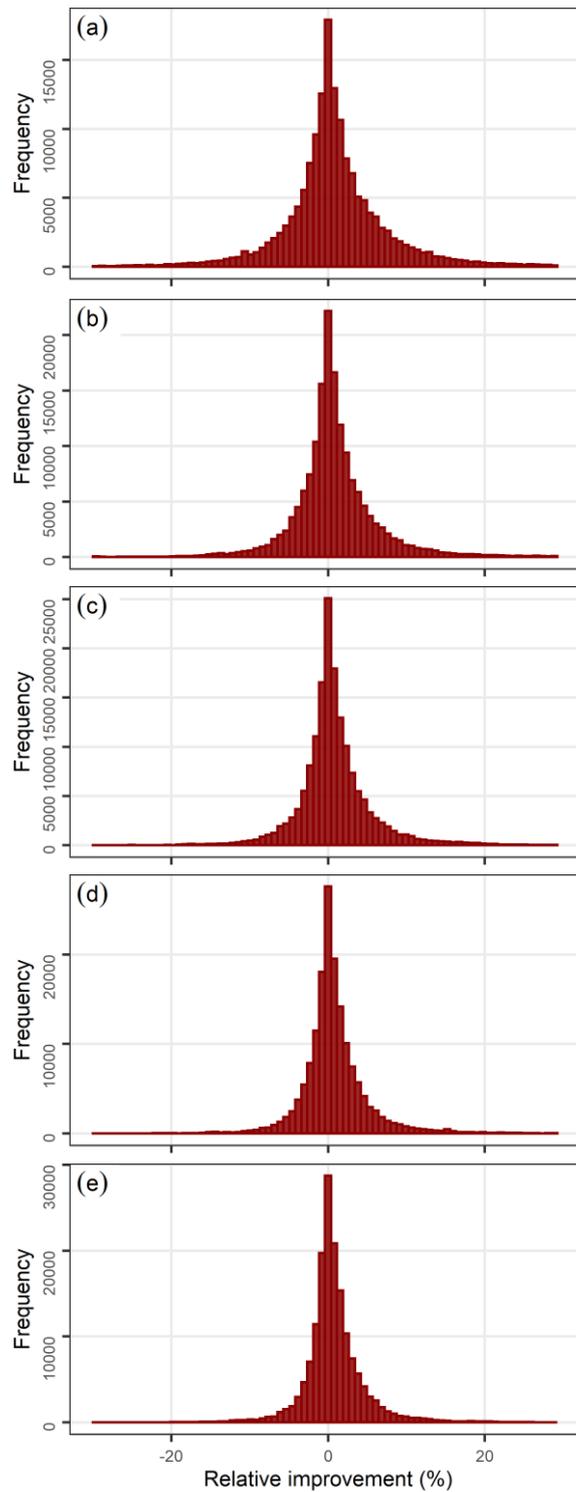
Figure S.11. Relative improvements $\{RI_{OUT,IN_i}, i = 1, ..., 600\}$ (defined with Equation 6) for ensemble scheme 6. The relative improvements are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at −30% and 30%. Each histogram summarizes 270 × 600 = 162 000 values.
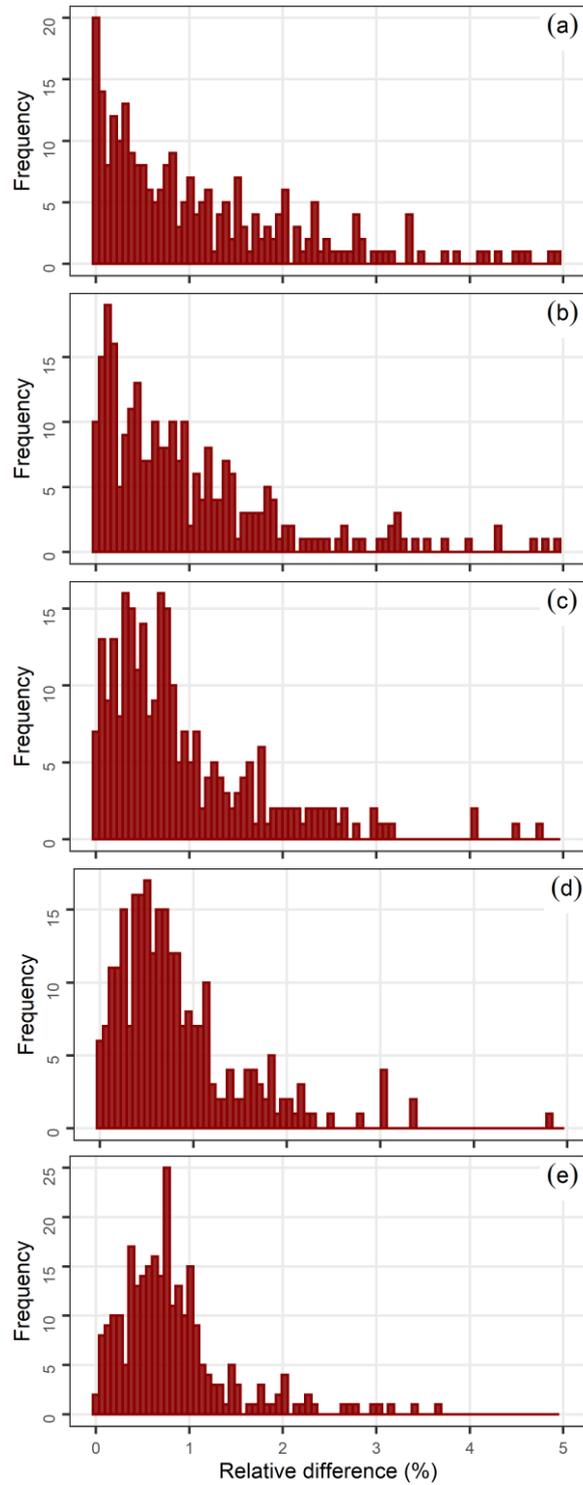
Figure S.12. Relative differences RD$_{\text{OUT,AAIS}_{\text{IN}}}$ (defined with Equation 8) for ensemble scheme 6. The relative differences are computed for all catchments, and for the (a) 99%, (b) 97.5%, (c) 95%, (d) 90% and (e) 80% prediction intervals obtained for the period T_3 (years 1975–1999). The horizontal axis has been truncated at 5%. Each histogram summarizes 270 values.

Table S.1. Summary statistics of the relative improvements $\{RI_{OUT,IN_i}, i = 1, ..., 600\}$ (defined with Equation 6). The relative improvements are computed for all catchments. Each row summarizes 270 × 600 = 162 000 values.

Ensemble scheme	Prediction intervals	Related histogram	Minimum	1st quartile	Median	Mean	3rd quartile	Maximum
1	99%	Figure S.3(a)	−47.41	−0.60	0.13	0.26	1.19	29.51
	97.5%	Figure S.3(b)	−41.53	−0.53	0.06	0.20	0.94	27.06
	95%	Figure S.3(c)	−32.80	−0.49	0.02	0.17	0.81	25.97
	90%	Figure S.3(d)	−27.56	−0.46	0.01	0.15	0.71	24.72
	80%	Figure S.3(e)	−31.00	−0.44	0.00	0.13	0.64	25.13
2	99%	Figure S.5(a)	−73.80	−2.35	0.47	0.74	3.76	44.12
	97.5%	Figure S.5(b)	−42.22	−1.80	0.37	0.68	2.98	37.77
	95%	Figure S.5(c)	−27.18	−1.41	0.29	0.61	2.43	34.48
	90%	Figure S.5(d)	−21.13	−1.10	0.26	0.55	1.99	31.96
	80%	Figure S.5(e)	−21.15	0.87	0.24	0.51	1.68	28.89
3	99%	Figure S.7(a)	−46.31	−2.38	−0.46	0.73	3.62	43.45
	97.5%	Figure S.7(b)	−31.00	−1.78	0.38	0.66	2.91	34.25
	95%	Figure S.7(c)	−22.22	−1.39	0.29	0.57	2.37	30.23
	90%	Figure S.7(d)	−19.45	−1.09	0.24	0.53	1.97	26.10
	80%	Figure S.7(e)	−16.76	−0.88	0.24	0.51	1.69	22.32
4	99%	Figure S.9(a)	−59.77	−0.62	0.24	1.13	2.02	85.65
	97.5%	Figure S.9(b)	−40.76	−0.53	0.12	0.82	1.49	46.03
	95%	Figure S.9(c)	−40.78	−0.56	0.07	0.48	1.19	51.69
	90%	Figure S.9(d)	−39.92	−0.48	0.05	0.38	1.07	30.10
	80%	Figure S.9(e)	−37.61	−0.41	0.06	0.31	0.86	25.26
5	99%	Figure 12(a)	−78.29	−1.83	0.29	0.82	3.19	60.40
	97.5%	Figure 12(b)	−34.01	−1.30	0.29	0.83	2.49	50.86
	95%	Figure 12(c)	−35.68	−1.09	0.28	0.74	2.21	42.05
	90%	Figure 12(d)	−36.14	−0.89	0.29	0.70	1.97	36.48
	80%	Figure 12(e)	−29.83	−0.79	0.31	0.71	1.92	30.96
6	99%	Figure S.11(a)	−327.10	−2.02	0.33	0.86	3.60	91.42
	97.5%	Figure S.11(b)	−41.40	−1.43	0.31	0.97	2.76	89.17
	95%	Figure S.11(c)	−33.07	−1.20	0.31	0.88	2.42	76.16
	90%	Figure S.11(d)	−42.84	−1.04	0.28	0.78	2.13	66.08
	80%	Figure S.11(e)	−31.70	−0.87	0.32	0.77	2.04	63.36

Table S.2. Summary statistics of the relative differences $RD_{OUT,AAIS_{IN}}$ (defined with Equation 8). The relative differences are computed for all catchments. Each row summarizes 270 values.

Ensemble scheme	Prediction intervals	Related histogram	Minimum	1st quartile	Median	Mean	3rd quartile	Maximum
1	99%	Figure S.4(a)	0.00	0.02	0.18	0.36	0.40	7.86
	97.5%	Figure S.4(b)	0.00	0.05	0.19	0.28	0.35	3.71
	95%	Figure S.4(c)	0.00	0.04	0.15	0.24	0.31	5.58
	90%	Figure S.4(d)	0.00	0.04	0.15	0.21	0.26	7.24
	80%	Figure S.4(e)	0.00	0.06	0.13	0.19	0.23	7.25
2	99%	Figure S.6(a)	0.00	0.38	0.91	1.19	1.66	7.83
	97.5%	Figure S.6(b)	0.00	0.39	0.76	0.95	1.28	9.29
	95%	Figure S.6(c)	0.00	0.31	0.63	0.79	1.07	10.82
	90%	Figure S.6(d)	0.00	0.30	0.60	0.68	0.89	11.04
	80%	Figure S.6(e)	0.00	0.31	0.58	0.60	0.78	9.52
3	99%	Figure S.8(a)	0.00	0.36	0.90	1.15	1.51	8.52
	97.5%	Figure S.8(b)	0.00	0.39	0.78	0.90	1.26	4.19
	95%	Figure S.8(c)	0.00	0.29	0.64	0.73	1.04	4.29
	90%	Figure S.8(d)	0.00	0.31	0.56	0.63	0.85	6.48
	80%	Figure S.8(e)	0.00	0.31	0.57	0.59	0.79	6.86
4	99%	Figure S.10(a)	0.00	0.05	0.36	1.56	1.24	34.62
	97.5%	Figure S.10(b)	0.00	0.07	0.30	1.02	0.85	26.08
	95%	Figure S.10(c)	0.00	0.09	0.27	0.60	0.65	18.58
	90%	Figure S.10(d)	0.00	0.09	0.23	0.46	0.48	10.76
	80%	Figure S.10(e)	0.00	0.11	0.23	0.39	0.38	7.20
5	99%	Figure 13(a)	0.00	0.22	0.77	1.30	1.62	19.46
	97.5%	Figure 13(b)	0.00	0.28	0.67	1.12	1.29	15.89
	95%	Figure 13(c)	0.00	0.36	0.67	0.94	1.11	12.32
	90%	Figure 13(d)	0.01	0.38	0.60	0.85	1.04	10.35
	80%	Figure 13(e)	0.02	0.42	0.71	0.84	1.01	8.97
6	99%	Figure S.12(a)	0.00	0.30	0.85	1.83	1.96	36.62
	97.5%	Figure S.12(b)	0.00	0.32	0.76	1.39	1.44	29.70
	95%	Figure S.12(c)	0.00	0.36	0.71	1.14	1.33	11.70
	90%	Figure S.12(d)	0.00	0.40	0.67	0.98	1.11	10.44
	80%	Figure S.12(e)	0.01	0.44	0.73	0.93	1.02	11.32