SUPPLEMENTARY MATERIAL
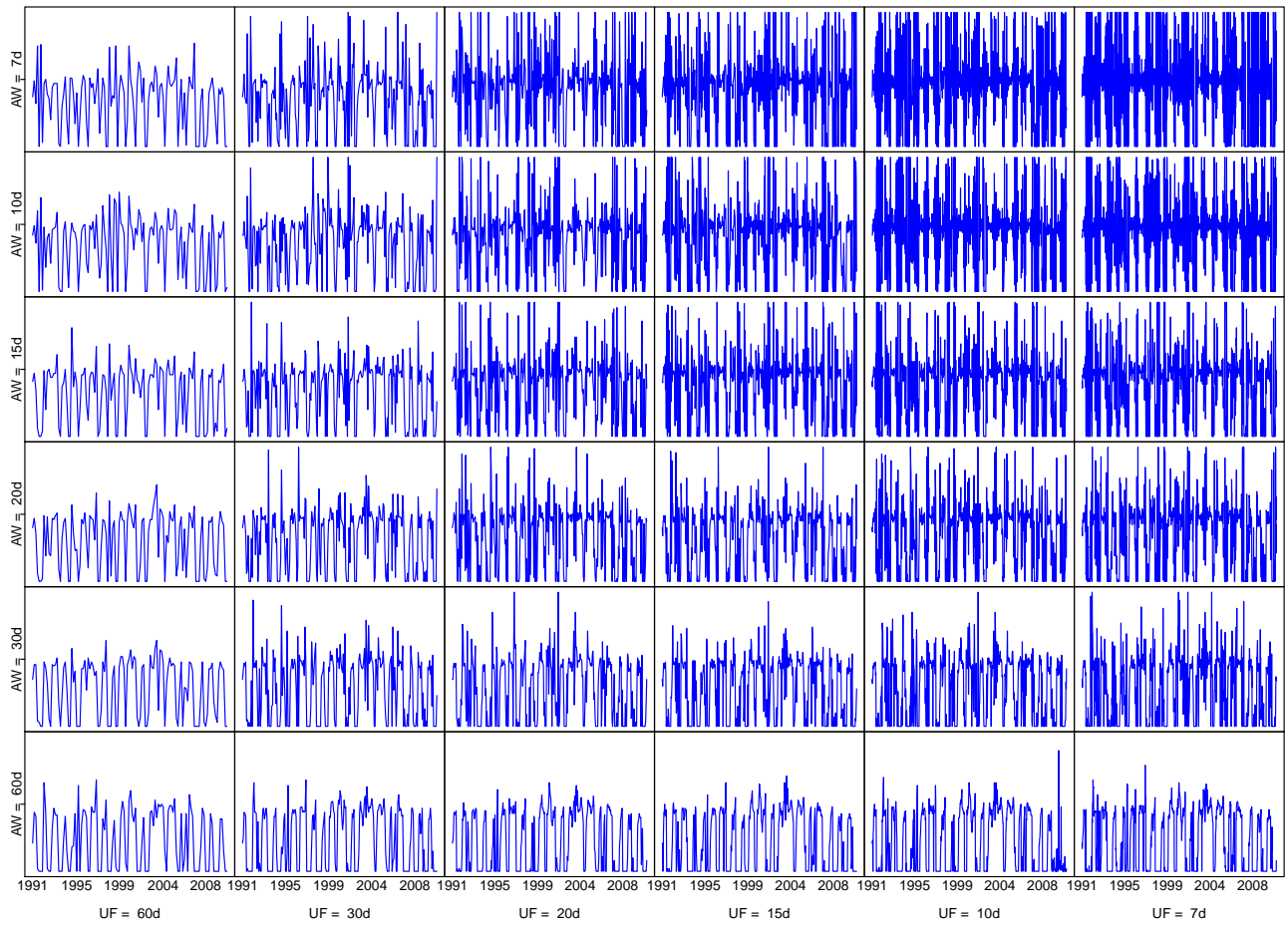
Figure S1. Time series of optimal K^* during 20 years of simulations under different schemes.

Mean of K* Scaling Factor

Variance of K* Scaling Factor
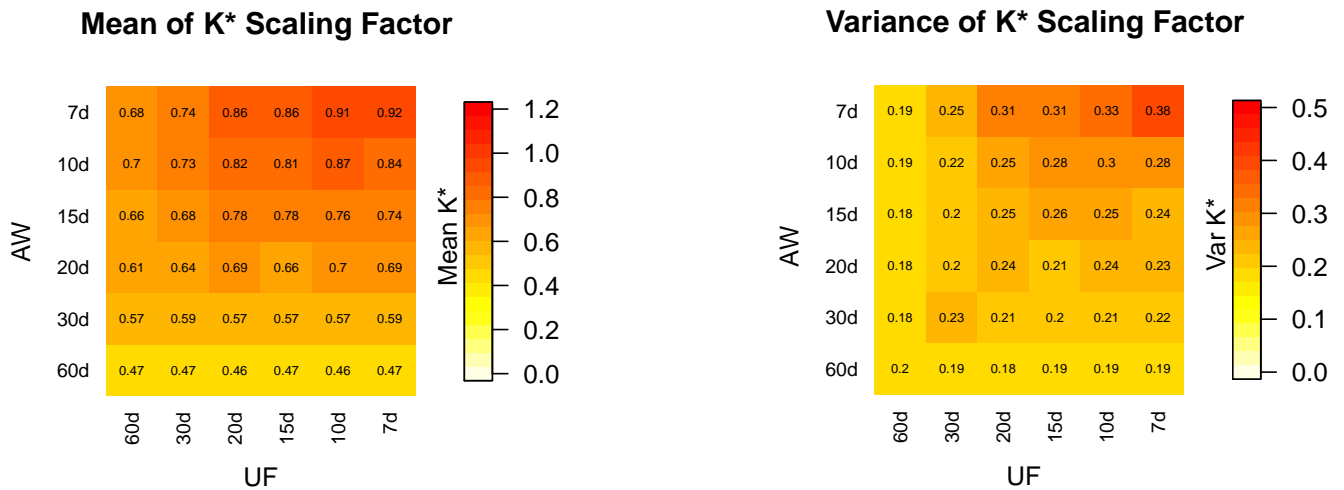
Figure S2. Summary statistics of K^* values during 20 years of simulations under different schemes.

		ECHAM Forecasts					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
NSE	0.21	+0.073	+0.079	+0.084	+0.084	+0.081	+0.081
KGE	0.41	+0.020	+0.017	+0.023	+0.016	+0.005	+0.003
RANK CORR	0.75	+0.015	+0.015	+0.022	+0.028	+0.006	-0.003
RRMSE	1.04	+0.049	+0.053	+0.057	+0.057	+0.055	+0.055
%BIAS	23.20	+0.865	+0.776	+0.761	+0.744	+0.714	+0.696

		Ensemble Mean from ESP					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
NSE	0.10	+0.092	+0.117	+0.126	+0.130	+0.127	+0.137
KGE	0.27	+0.048	+0.073	+0.084	+0.080	+0.075	+0.078
RANK CORR	0.73	+0.008	+0.006	+0.015	+0.015	-0.017	-0.017
RRMSE	1.11	+0.058	+0.075	+0.081	+0.084	+0.082	+0.088
%BIAS	38.48	+13.900	+23.388	+25.150	+26.803	+29.600	+32.021

Figure S3. Performance of deterministic monthly streamflow forecasting using (un)updated model states from (OL)DA simulation schemes. The verification metrics of DA-aided forecasts are shown for different assimilation window lengths. This table shows a detailed information regarding Table2.

		$>Q_{67}$					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
BS	0.185	+0.014	+0.015	+0.020	+0.021	+0.018	+0.025
REL	0.045	+0.002	+0.015	+0.021	+0.017	+0.024	+0.024
RES	0.065	-0.000	+0.009	+0.010	+0.005	+0.017	+0.009

		$<Q_{33}$					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
BS	0.186	+0.023	+0.040	+0.050	+0.055	+0.050	+0.051
REL	0.059	+0.021	+0.029	+0.024	+0.041	+0.032	+0.036
RES	0.094	-0.002	+0.010	+0.024	+0.007	+0.014	+0.013

		$>Q_{90}$					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
BS	0.106	-0.008	-0.001	0.000	0.002	0.005	0.008
REL	0.049	-0.002	0.007	0.002	0.007	0.013	0.018
RES	0.030	-0.012	-0.018	-0.015	-0.017	-0.017	-0.023

		$<Q_{10}$					
	OL	**DA [A.W.]**					
		-2m	**-1m**	**-20d**	**-15d**	**-10d**	**-7d**
BS	0.085	0.003	0.009	0.012	0.010	0.009	0.009
REL	0.034	0.010	0.018	0.022	0.021	0.029	0.030
RES	0.043	-0.008	-0.011	-0.012	-0.016	-0.026	-0.029

Figure S4. Performance of probabilistic monthly streamflow forecasting through ESP using (un)updated model states from (OL)DA simulation schemes assessed on different categories of flows. The verification metrics of DA-aided forecasts are shown for different assimilation window lengths. This table shows a detailed information regarding Table3.