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Evaluating E-OBS forcing data for large-sample hydrology using model performance diagnostics

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Figures S1 to S6 and Table S1

Introduction

This document provides some figures and a table that act as extra information for the paper entitled "Evaluating E-OBS forcing data for large-sample hydrology using model performance diagnostics".

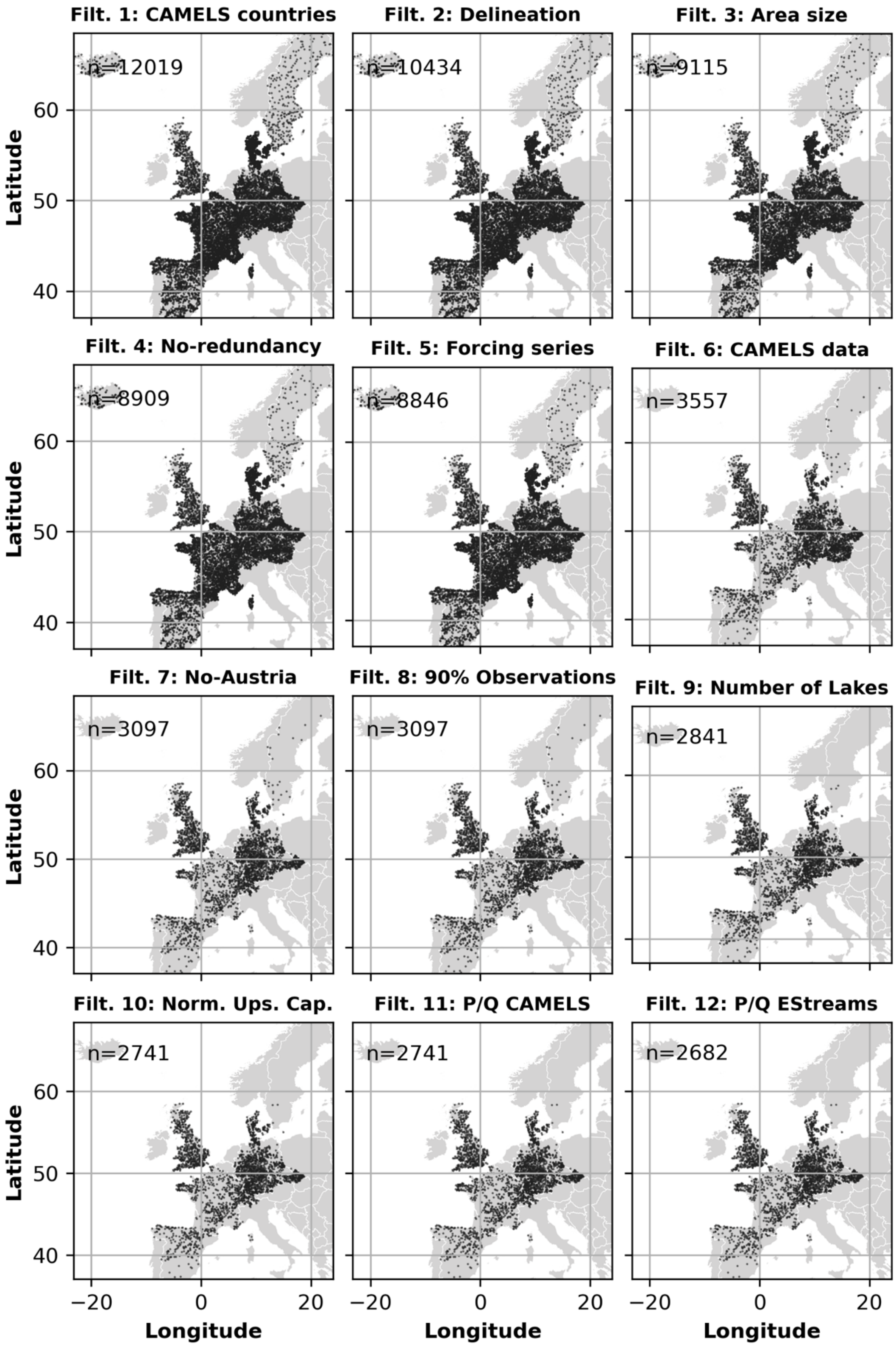

Figure S1: Spatial distribution of the catchments after applying each filter, as described in section 2.1 of the paper.

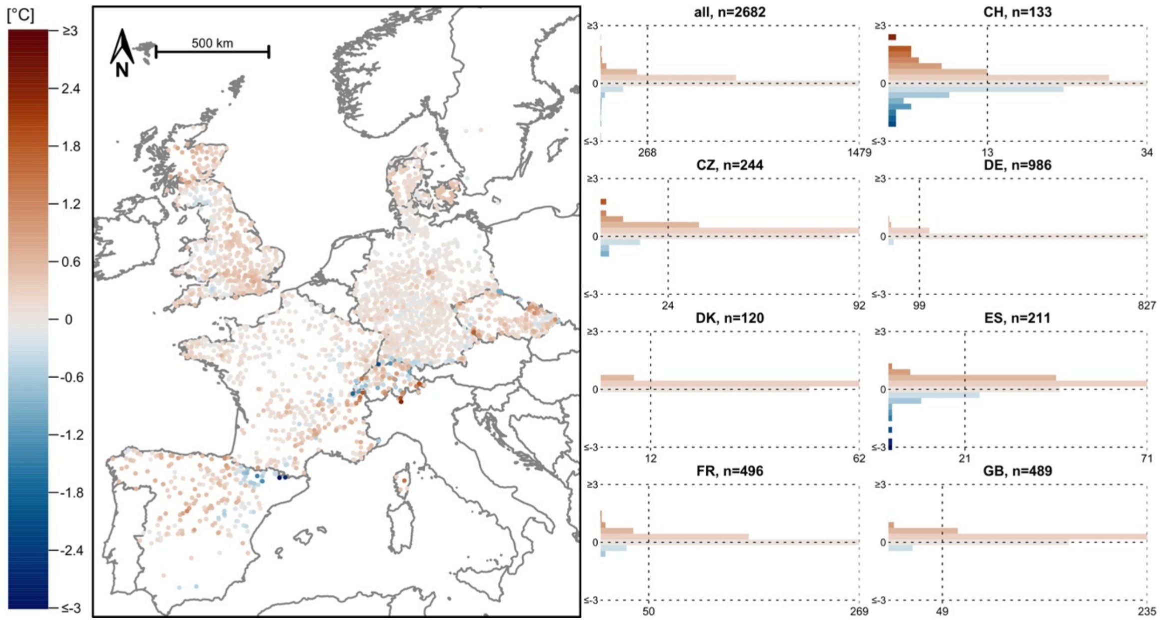

Figure S2: Difference in mean annual temperature for each catchment when calculated from the E-OBS and the CAMELS datasets for the 20-year period 1995-2015. Positive values and red colours indicate higher temperatures in the E-OBS data obtained from EStreams, negative values and blue colours indicate lower temperatures in the E-OBS data. Note that the colour scale was cut at ±3 °C.

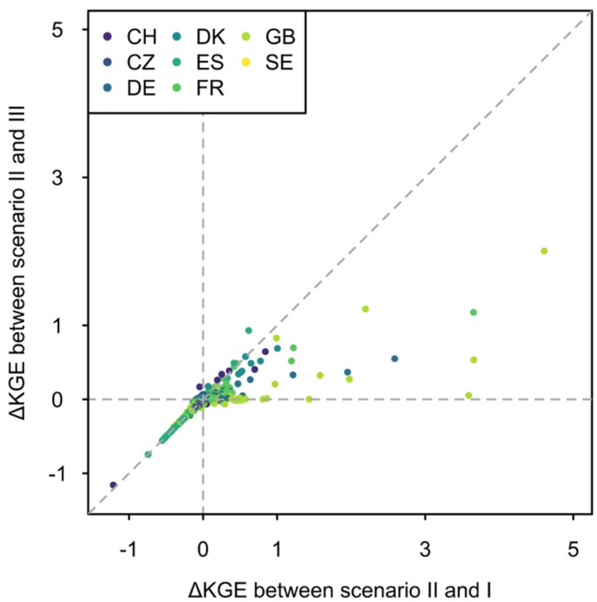

Figure S3: **Differences in model performance between scenario II and I (positive values indicate higher performances with the E-OBS data obtained from EStreams, negative values indicate higher performances with the CAMELS data) compared to differences in model performance between scenarios II and III (positive values indicate higher performances with the E-OBS data, negative values indicate higher performances when the precipitation data were replaced with those from CAMELS). One catchment (in Great Britain) plotted outside the axis limits (9.9 / 4.5). Pearson's correlation coefficient was 0.87.**

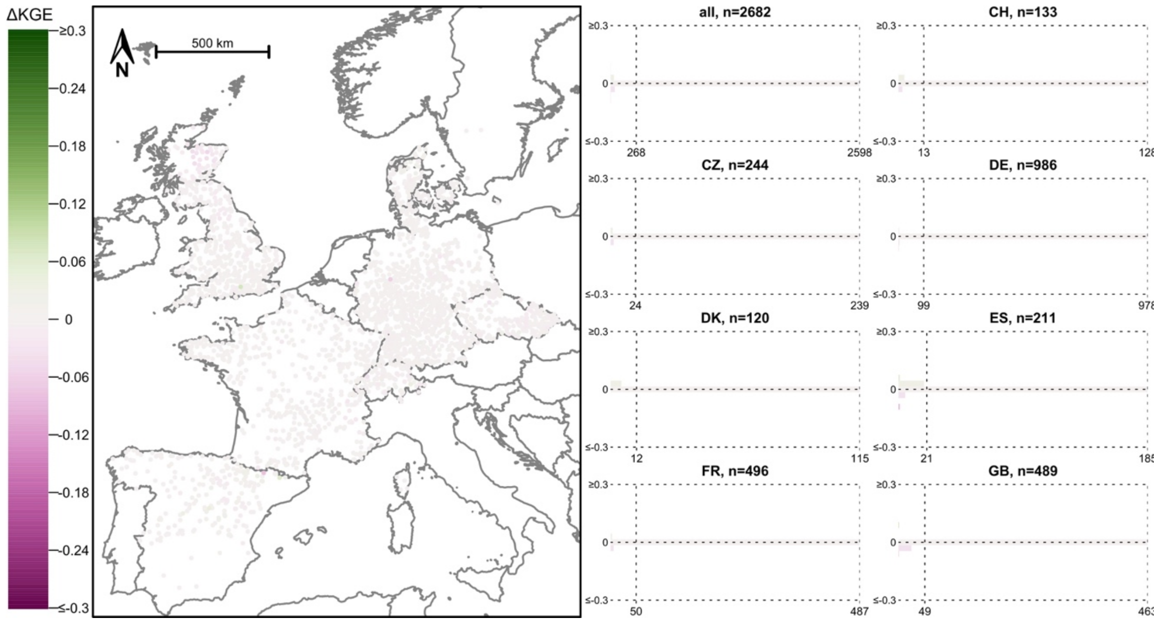

Figure S4: **Difference in model performance when all meteorological input data were obtained from E-OBS (i.e., EStreams, scenario II) and when the temperature data from E-OBS were replaced with those from CAMELS (scenario V). Positive values and green colours indicate higher model performances with the *T* data from E-OBS, negative values and pink colours indicate higher model performances with the *T* data from CAMELS. Note that the colour scale was cut at a difference in KGE of ±0.3. The catchments with the largest differences in model performance were plotted last to increase their visibility.**

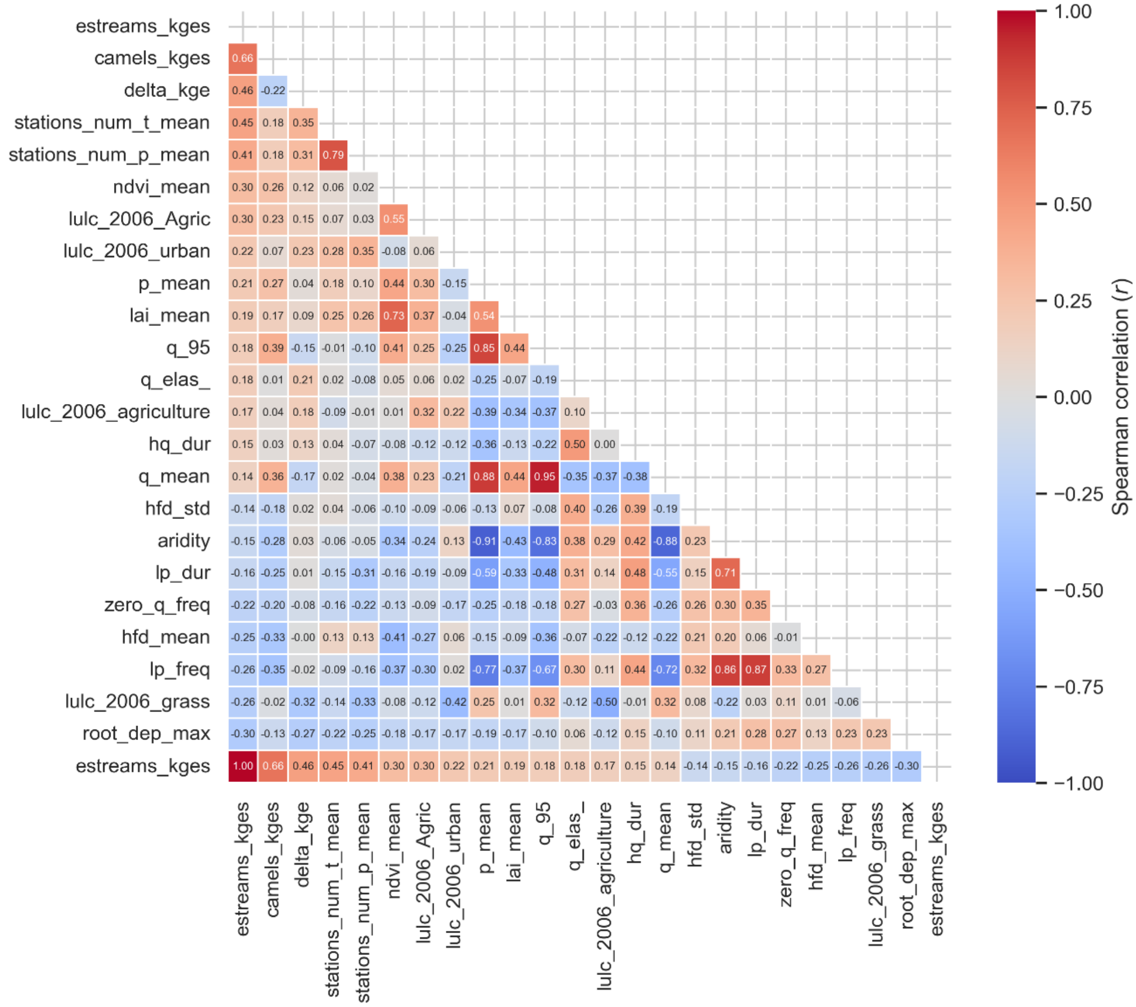

Figure S5: Heatmap of the correlations of the model performances in scenario I (CAMELS forcing data), in scenario II (EStreams forcing data), and the differences in model performances with the catchment attributes derived from the EStreams dataset. The heatmap shows only the attributes for which the correlation with estreams_kge showed a Spearman rank correlation above or equal to 0.15. Note that these results are complemented by Table S1.

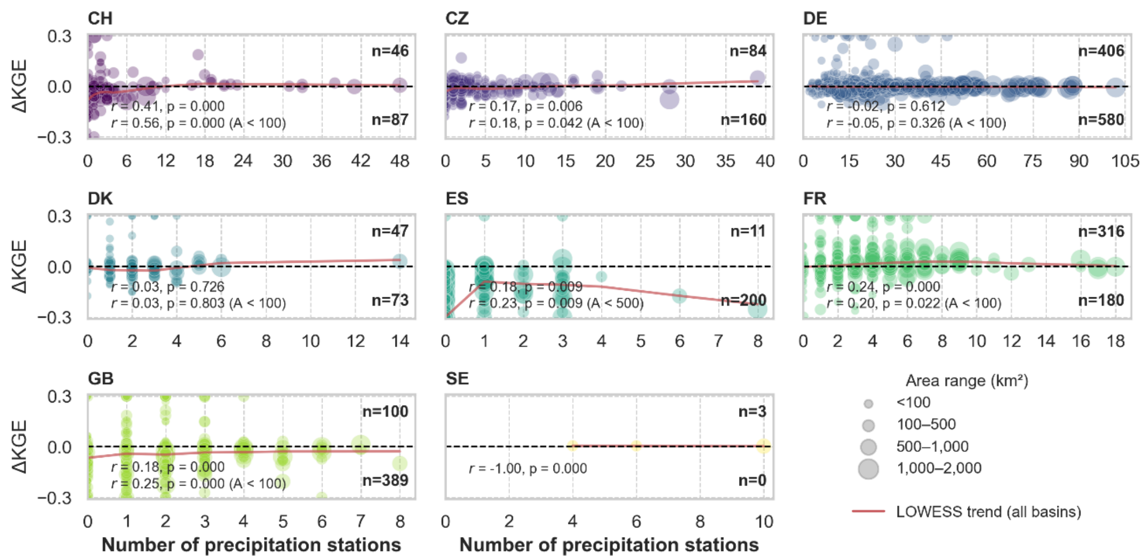

Figure S6: Scatterplots showing the difference in model performance (Kling-Gupta efficiency, KGE) between scenario II (E-OBS data obtained from EStreams) and scenario I (CAMELS data) (y-axis) versus the number of precipitation stations used to derive the E-OBS precipitation data per country. Each circle represents one catchment. The size of the circle indicates the catchment area. Positive values indicate higher performances when the E-OBS data were used, negative values indicate higher performances when the CAMELS data were used. Note that the y-axes were cut at ±0.3, in accordance with Fig. 6 in the manuscript. Note that the x-axes differ for the different subplots.

Table S1: Spearman rank correlations and their respective significance for the model performances in scenario I (camels_kges), scenario II (estreams_kges), their differences (delta_kge), and some catchment attributes available in the EStreams dataset. Significance levels: * *p*-value < 0.001, ** *p*-value < 0.01, * *p*-value < 0.05, ns = not significant.**

variable	camels_kges_r	camels_kges_sig	estreams_kges_r	estreams_kges_sig	delta_kge_r	delta_kge_sig
estreams_kges	0.665	***	1	***	0.463	***
camels_kges	1	***	0.665	***	-0.222	***
delta_kge	-0.222	***	0.463	***	1	***
stations_num_t_mean	0.177	***	0.447	***	0.355	***
stations_num_p_mean	0.184	***	0.412	***	0.307	***
ndvi_mean	0.262	***	0.301	***	0.124	***
lulc_2006_Agric	0.227	***	0.296	***	0.146	***
root_dep_max	-0.132	***	-0.296	***	-0.27	***
lulc_2006_grass	-0.025	ns	-0.258	***	-0.317	***
lp_freq	-0.353	***	-0.257	***	-0.016	ns
hfd_mean	-0.326	***	-0.252	***	-0.002	ns
lulc_2006_urban	0.066	***	0.223	***	0.226	***
zero_q_freq	-0.204	***	-0.217	***	-0.079	***
p_mean	0.271	***	0.209	***	0.038	*
lai_mean	0.172	***	0.189	***	0.089	***
q_95	0.39	***	0.183	***	-0.148	***
q_elas_	0.007	ns	0.177	***	0.206	***
lulc_2006_agriculture	0.039	*	0.171	***	0.184	***
lp_dur	-0.252	***	-0.157	***	0.008	ns
aridity	-0.276	***	-0.154	***	0.034	ns
hq_dur	0.027	ns	0.149	***	0.125	***
q_mean	0.36	***	0.143	***	-0.175	***
hfd_std	-0.184	***	-0.141	***	0.02	ns
strm_dens	0.193	***	0.136	***	-0.063	**
hp_freq	-0.295	***	-0.136	***	0.082	***
slope_sawicz	0.188	***	0.135	***	-0.019	ns
ele_mt_mean	-0.092	***	-0.129	***	-0.079	***
ele_mt_max	-0.019	ns	-0.124	***	-0.148	***
ele_mt_min	-0.157	***	-0.109	***	0.009	ns
hp_dur	-0.151	***	-0.106	***	-0.014	ns
p_seasonality	-0.219	***	-0.098	***	0.118	***
root_dep_min	-0.193	***	-0.083	***	0.125	***

variable	camels_kges_r	camels_kges_sig	estreams_kges_r	estreams_kges_sig	delta_kge_r	delta_kge_sig
soil_fra_silt_mean	0.083	***	0.082	***	0.038	*
q_runoff_ratio	0.376	***	0.08	***	-0.289	***
lakes_num	0.099	***	0.079	***	-0.012	ns
lakes_tot_area	0.096	***	0.067	***	-0.026	ns
soil_tawc_mean	0.112	***	0.067	***	0	ns
lulc_2006_forest	-0.005	ns	0.061	**	0.064	***
soil_bd_mean	-0.079	***	0.059	**	0.155	***
lakes_tot_vol	0.094	***	0.059	**	-0.034	ns
slp_dg_mean	0.089	***	-0.053	**	-0.149	***
soil_fra_clay_mean	-0.008	ns	0.048	*	0.069	***
steep_area_fra	0.102	***	-0.048	*	-0.164	***
flat_area_fra	-0.096	***	0.042	*	0.138	***
sno_cov_mean	-0.004	ns	-0.039	*	0.001	ns
frac_snow	-0.073	***	-0.035	ns	0.042	*
lulc_2006_NonIrriAgri	-0.083	***	0.035	ns	0.123	***
q_5	0.189	***	0.034	ns	-0.14	***
pet_mean	-0.21	***	-0.033	ns	0.127	***
baseflow_index	-0.098	***	-0.028	ns	0.023	ns
res_num	0.066	***	-0.025	ns	-0.098	***
soil_fra_sand_mean	-0.015	ns	-0.024	ns	-0.021	ns
soil_oc_mean	0.173	***	-0.022	ns	-0.201	***
lq_dur	-0.008	ns	-0.022	ns	-0.032	ns
lp_time	0.061	**	0.016	ns	-0.075	***
hp_time	-0.088	***	-0.015	ns	0.071	***
dam_num	0.07	***	-0.014	ns	-0.09	***
lq_freq	0.007	ns	-0.014	ns	-0.01	ns
root_dep_mean	-0.116	***	-0.008	ns	0.132	***
elon_ratio	0	ns	-0.007	ns	0.003	ns
soil_fra_grav_mean	-0.018	ns	-0.001	ns	-0.023	ns
hq_freq	-0.009	ns	-0.001	ns	0.038	ns