Supplement of: Imprints of Increases in Evapotranspiration on Decreases in Streamflow during dry Periods, a large-sample Analysis in Germany

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Supplement 1

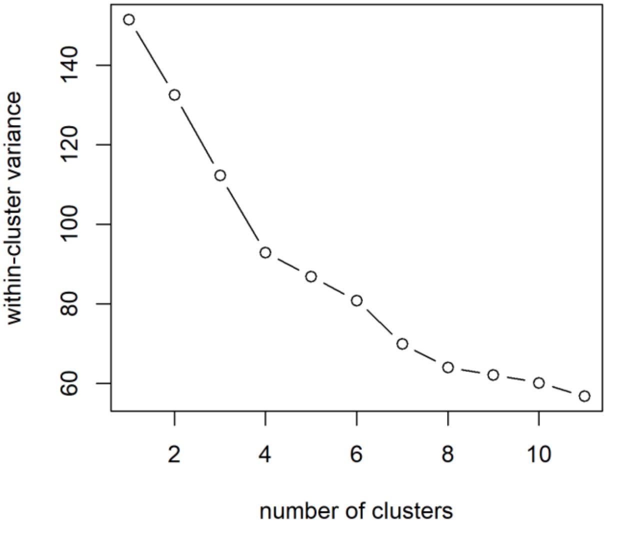

Fig. S1: Within-cluster variance for different numbers of clusters (Sect. 2.1).

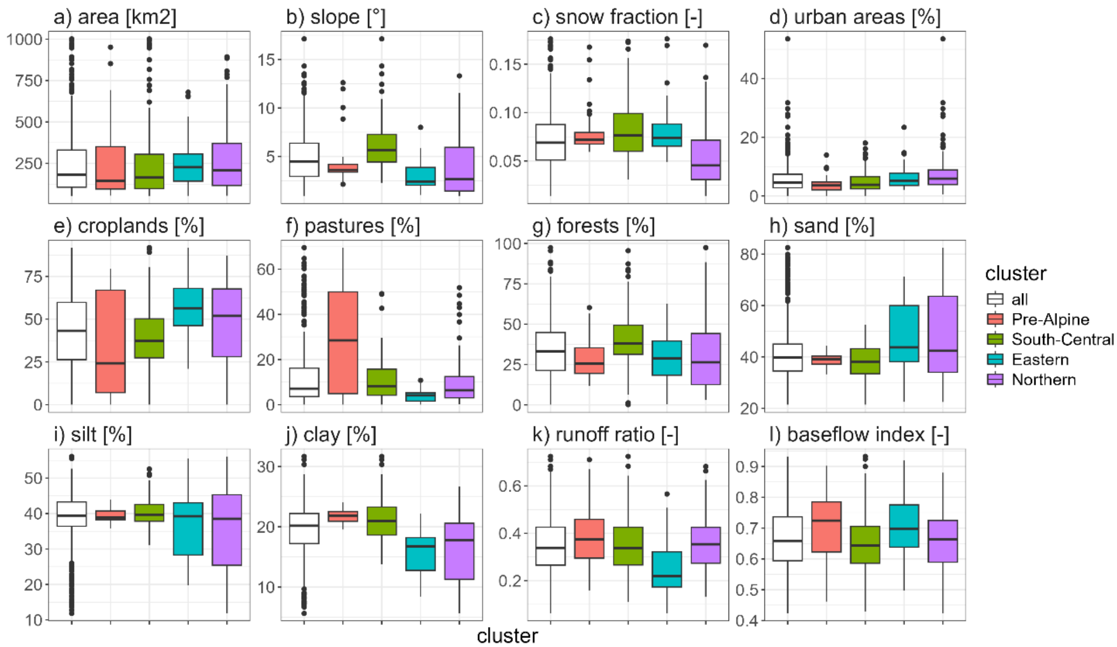

Fig. S2: Attributes of the study catchments. Boxplots of (a) area, (b) slope, (c) snow fraction, (d) urban, (e) cropland, (f) pastures, (g) forests, (h) sand, (i) silt, (j) clay, (k) runoff ratio, and (l) baseflow index for all catchments and by clusters. Details on the attributes are in Table 1.

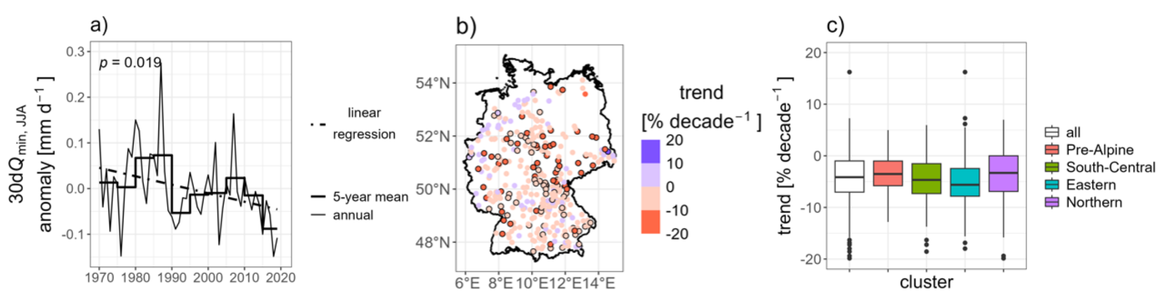

Fig. S3: Long-term variations in 30d$Q_{\text{min, JJA}}$, as a metric for the magnitude of summer low flows, over 1970–2019. (a) Average anomalies across the study catchments. (b) Map of catchment-scale trends (black edges if significant). (c) Boxplots of trends for all catchments and by cluster.

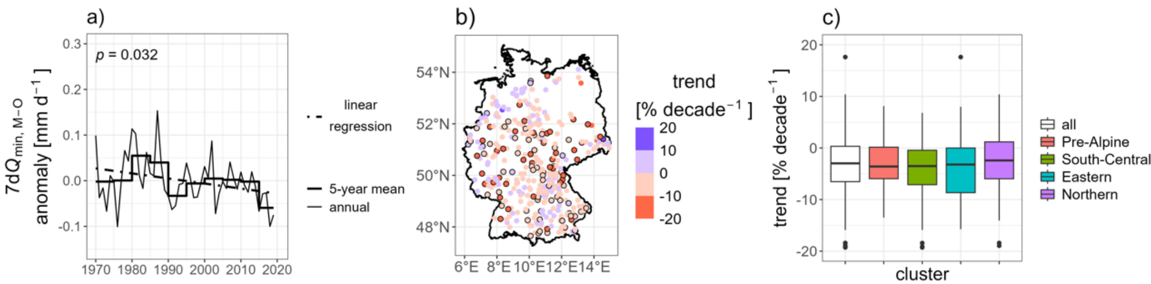

Fig. S4: Long-term variations in 7d$Q_{\mathrm{min,\,M\text{-}O}}$, as a metric for the magnitude of summer low flows, over 1970–2019. (a) Average anomalies across the study catchments. (b) Map of catchment-scale trends (black edges if significant). (c) Boxplots of trends for all catchments and by cluster.

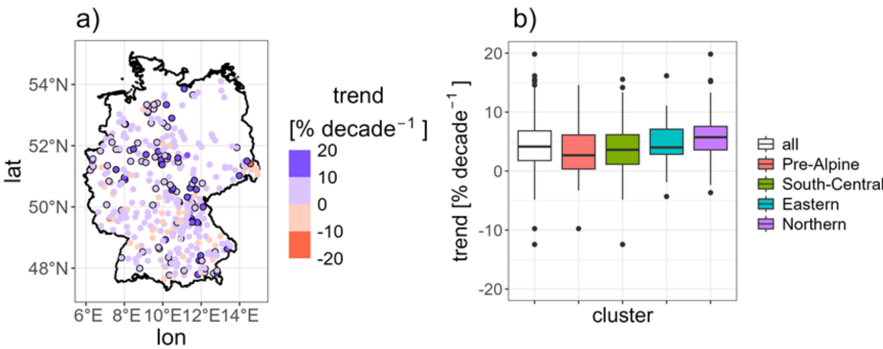

Fig. S5: Long-term variations annual catchment evapotranspiration (*E*) over 1970–1999. (a) Map of catchment-scale trends (black edges if significant). (b) Boxplots of trends for all catchments and by cluster.

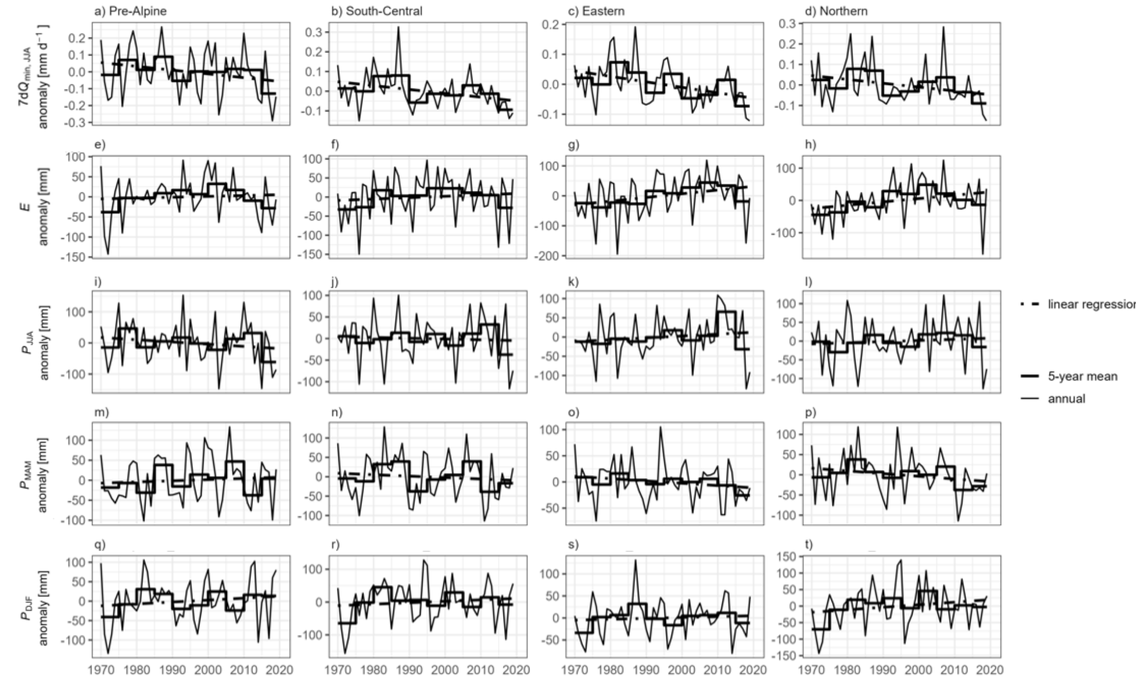

Fig. S6: Long-term variations in summer low flows ($7dQ_{min,\ JJA}$, panels a–d) and their potential predictors (annual evapotranspiration, *E*, e–h, precipitation over summer, P_{JJA}, i–l, spring, P_{MAM}, m–p, and winter P_{DJF}, q–t) over 1970–2019. Average anomalies across the catchments in each cluster.

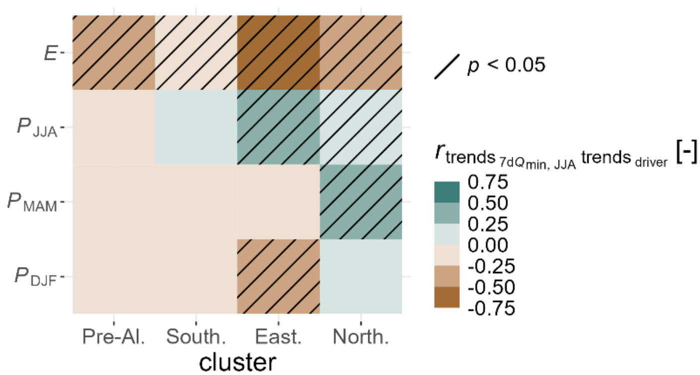

Fig. S7: Attribution of long-term variations in summer low flows to their predictors (strength of spatial coherence): Pearson's correlation coefficients (*r*) between catchment-scale trends in summer low flows ($7dQ_{min,\ JJA}$) and in potential predictors (annual evapotranspiration, *E*; summer precipitation, P_{JJA}; spring precipitation P_{MAM}; and winter precipitation, P_{DJF}) over 1970–1999, for the catchments in the different clusters. Pre-al. refers to Pre-Alpine, South. to South-Central, East. to Eastern, and North. to Northern cluster.

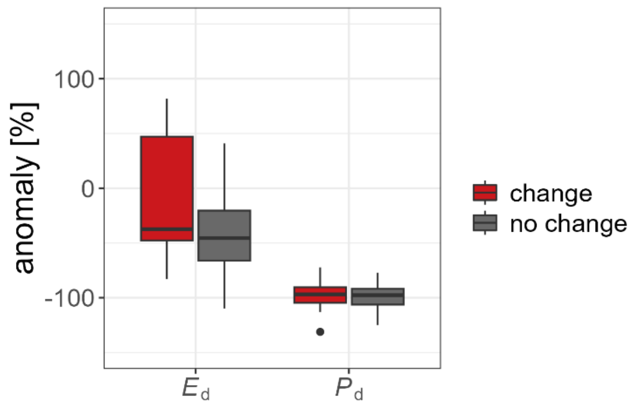

Fig. S8: Boxplots of mean anomalies over the multi-year drought between 1989 and 1993 in detrended annual evapotranspiration (E_d) and precipitation (P_d), for catchments with change and no change in the annual relationship between precipitation and streamflow during the multi-year drought.

Table S1: Model results from the multiple linear regressions on cluster-average data: coefficients of determination of the model (R^2) and standardized coefficients (Eq. 4, * if significant) for each cluster. α_1 refers to annual evapotranspiration, α_2 to summer precipitation (P), α_3 to spring P, and α_4 to winter P.

Cluster	R^2	α_1	α_2	α_3	α_4
Pre-Alpine	0.7	-0.16	0.89*	0.42	0.44
South-Central	0.87	-0.36	0.63*	0.76*	0.34
Eastern	0.95	-0.74*	0.64*	0.65*	0.09
Northern	0.94	-0.64*	0.67*	0.75*	0.25