

Identification of appropriate temporal scales of dominant low flow indicators in the Main River, Germany

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Abstract Models incorporating the appropriate temporal scales of dominant indicators for low flows are assumed to perform better than models with arbitrary selected temporal scales. In this paper, we investigate appropriate temporal scales of dominant low flow indicators: precipitation (P), evapotranspiration (ET) and the standardized groundwater storage index (G). This analysis is done in the context of low flow forecasting with a lead time of 14 days in the Main River, a tributary of the Rhine River, located in Germany. Correlation coefficients (i.e. Pearson, Kendall and Spearman) are used to reveal the appropriate temporal scales of dominant low flow indicators at different time lags between low flows and indicators and different support scales of indicators. The results are presented for lag values and support scales, which result in correlation coefficients between low flows and dominant indicators falling into the maximum 10% percentile range. P has a maximum Spearman correlation coefficient (ρ) of 0.38 ($p = 0.95$) at a support scale of 336 days and a lag of zero days. ET has a maximum ρ of -0.60 ($p = 0.95$) at a support scale of 280 days and a lag of 56 days and G has a maximum ρ of 0.69 ($p = 0.95$) at a support scale of 7 days and a lag of 3 days. The identified appropriate support scales and lags can be used for low flow forecasting with a lead time of 14 days.

Key words low flows; standardized groundwater storage index; rank correlation; support scale; time lag; Main River, Germany