Supplement of

Incorporating experimentally derived streamflow contributions into model parameterization to improve discharge prediction

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## Supplemental Information

### 1 Performance measures used for evaluating the discharge simulations

|   | Performance measure | Formula |
|---|---------------------|---------|
| 1 | Kling-Gupta efficiency $\text{KGE}_Q$ (see 5, 6, 7 for definitions of $\alpha_Q$, $\beta_Q$ and $r_Q$) | $1 - \sqrt{(1 - \alpha_Q)^2 - (1 - \beta_Q)^2 - (1 - r_Q)^2}$ |
| 2 | Nash-Sutcliffe efficiency $\text{NSE}_Q$ ($n$: number of observations) | $1 - \frac{\sum_n (Q_{obs} - Q_{sim})^2}{\sum_n (Q_{obs} - Q_{obs})^2}$ |
| 3 | Logarithmic Nash-Sutcliffe efficiency $\text{logNSE}_Q$ | $1 - \frac{\sum_n (\log Q_{obs} - \log Q_{sim})^2}{\sum_n (\log Q_{obs} - \log Q_{obs})^2}$ |
| 4 | Root Mean Squared Error $\text{RMSE}_Q$ | $\sqrt{\frac{\sum_n (Q_{obs} - Q_{sim})^2}{n}}$ |
| 5 | Bias of the simulated and observed discharges $\beta_Q$ | $\frac{Q_{sim}}{Q_{obs}}$ |
| 6 | Relative variability in the simulated and observed discharges $\alpha_Q$ ($\sigma$: standard deviation) | $\frac{\sigma_{sim}}{\sigma_{obs}}$ |
| 7 | Linear correlation between simulated and observed discharges $r_Q$ | Linear correlation coefficient between $Q_{sim}$ and $Q_{obs}$ |
2 Reduction of the 2,000,000 parameter sets using $\text{KGE}_Q \geq 0.5$, and $F_{HS}$ and $F_{GW} \pm 20\%$

![Diagram](image)

Figure S1: Iterative reduction of the initial sample of 2,000,000 parameter sets using the KGE$_Q$ and hydrograph-separation derived streamflow contributions for the individual years 2013 and 2014, as well as for both years together. (a) Using a more relaxed threshold of $\text{KGE}_Q \geq 0.5$ (and $F_{HS}$ and $F_{GW} \pm 10\%$), and (b) a more relaxed threshold of $F_{HS}$ and $F_{GW} \pm 20\%$ (and $\text{KGE}_Q \geq 0.8$).
Parameter distributions obtained by using \( \text{KGE}_Q \geq 0.5 \), and \( F_{HS} \) and \( F_{GW} \pm 20\% \)

Figure S2: Initial parameter distribution and their modification along the three parameter estimation steps for the individual years 2013 and 2014, as well as for both years together. Boxes indicate the range between the 25\(^{th}\) and 75\(^{th}\) percentile, lower and upper whiskers show the 5\(^{th}\) and 95\(^{th}\) percentile, respectively. (a) Using a more relaxed threshold of \( \text{KGE}_Q \geq 0.5 \) (and \( F_{HS} \) and \( F_{GW} \pm 10\% \)), and (b) a more relaxed threshold of \( F_{HS} \) and \( F_{GW} \pm 20\% \) (and \( \text{KGE}_Q \geq 0.8 \)).