

## Supplementary material

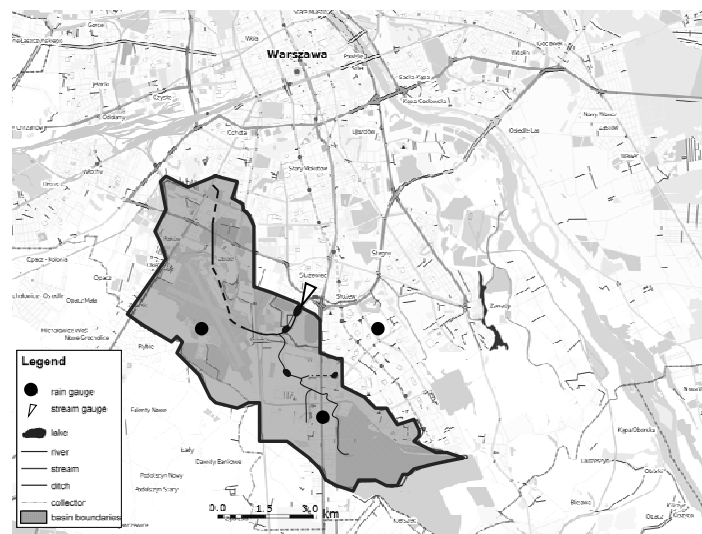
### Considering rating curve uncertainty in water level predictions

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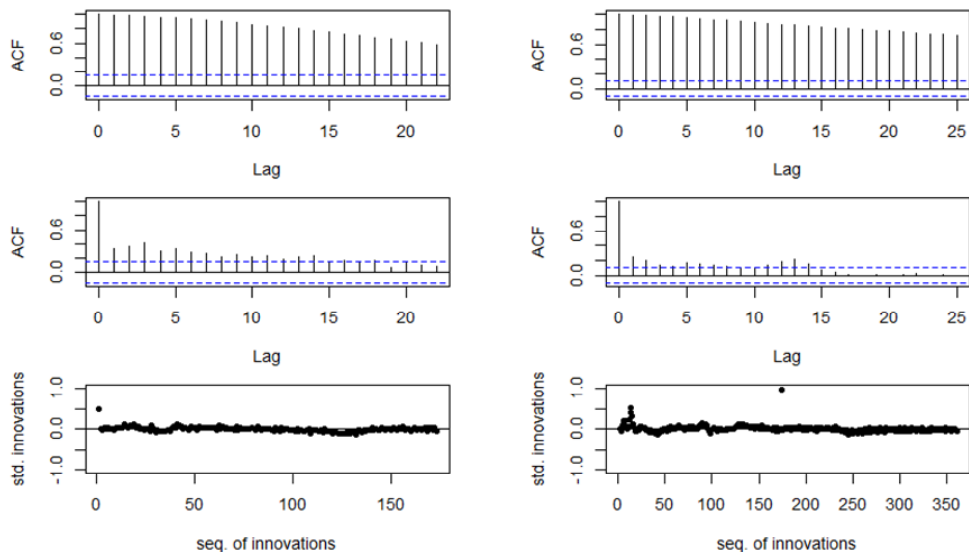
*Hydrology and Earth System Sciences*

<sup>[1]</sup>Swiss Federal Institute of Aquatic Science and Technology (Eawag), Dept. of Urban Water Management, Dübendorf, Switzerland

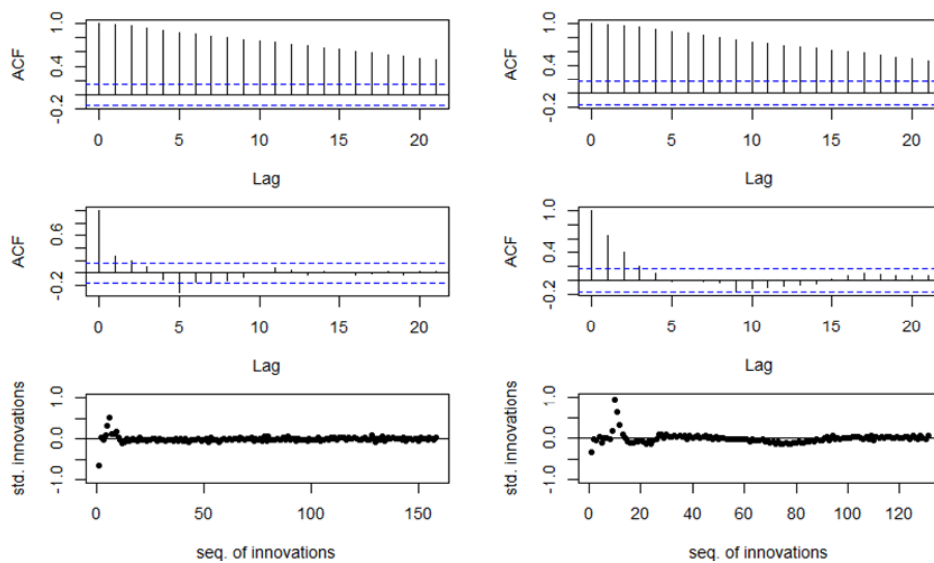
<sup>[2]</sup>Warsaw University of Life Sciences - SGGW, Dept. of Hydraulic Engineering, Warsaw, Poland



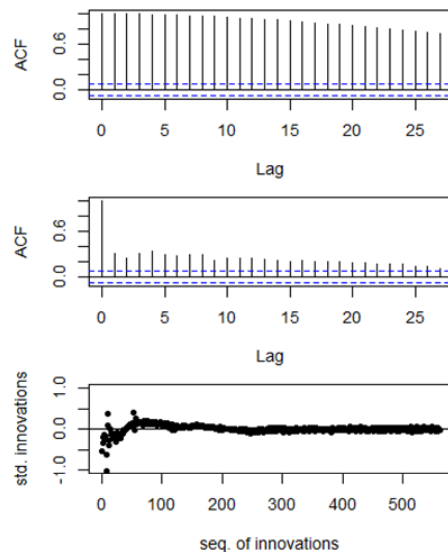
S1 Overview of a Sluzew Creek catchment and gauge sites



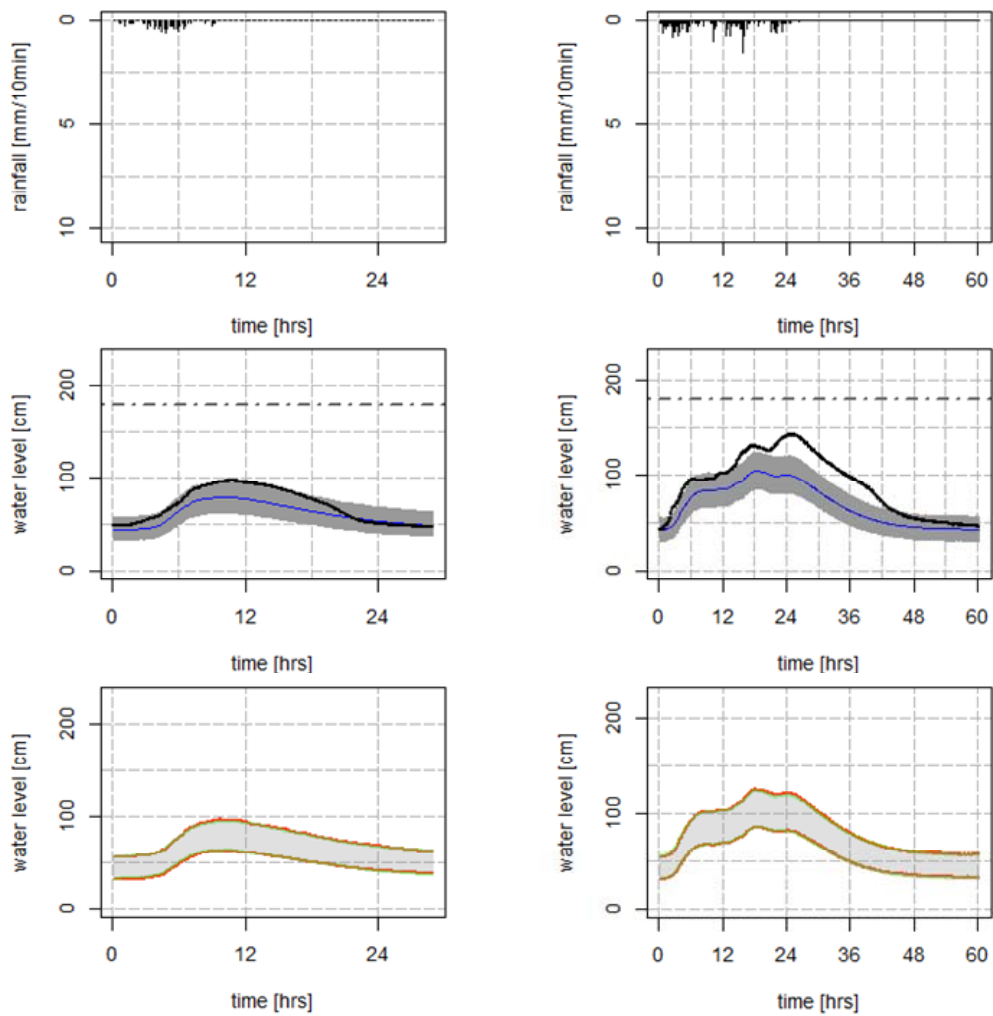
S2 Diagnostic plot of innovations and residuals for the events #1 and #2; Lumped error model: autocorrelation function (ACF) of standardized innovations (top row) and sequences of innovations (middle row), Traditional error model: ACF of standardized residuals (bottom row).



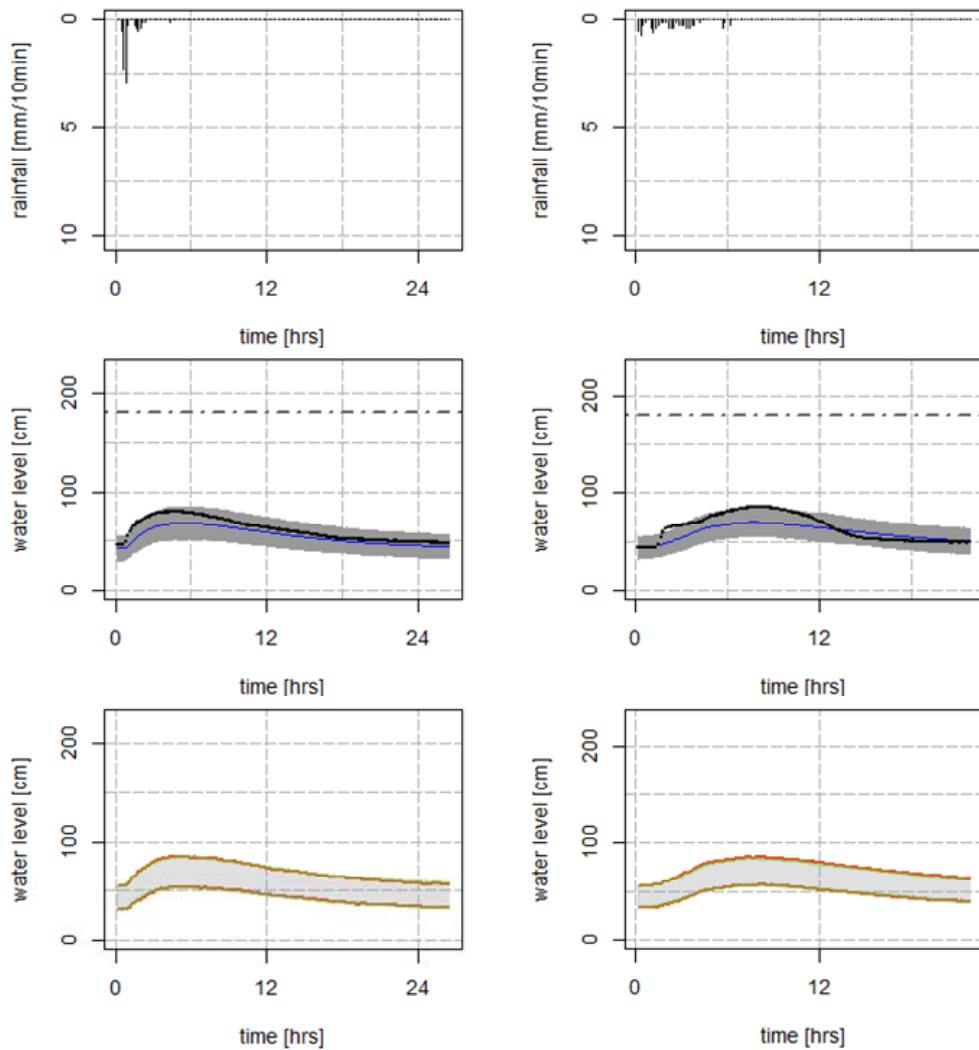
S3 Diagnostic plot of innovations and residuals for the events #3 and #4; Lumped error model: autocorrelation function (ACF) of standardized innovations (top row) and sequences of innovations (middle row), Traditional error model: ACF of standardized residuals (bottom row).



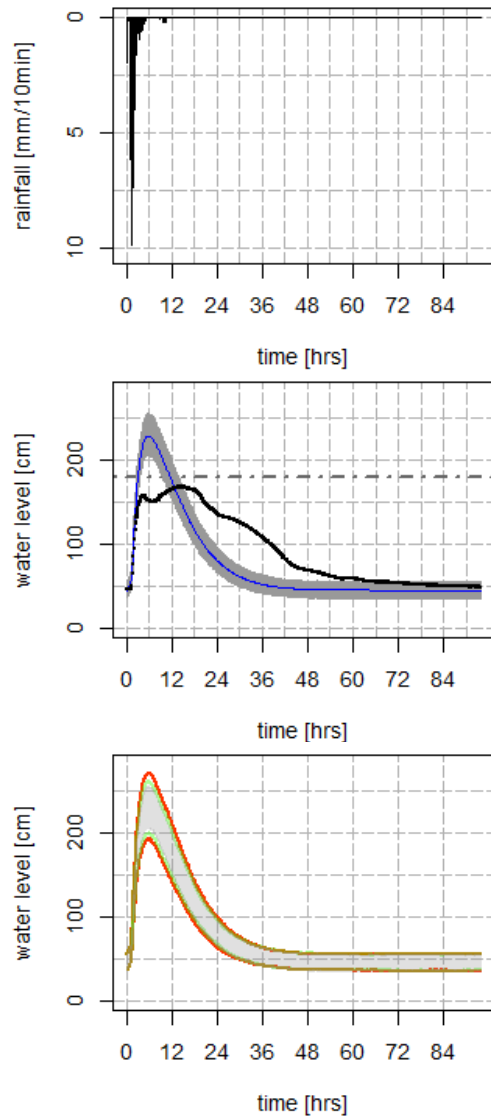
S4 Diagnostic plot of innovations and residuals for the event #8; Lumped error model: autocorrelation function (ACF) of standardized innovations (top row) and sequences of innovations (middle row), Traditional error model: ACF of standardized residuals (bottom row).



S5 Predicted water levels in the Sluzew Creek using the posterior parameter distribution for the events #1 and #2. Dotted black lines present observations, solid blue lines illustrate predicted water levels corresponding to the mode posterior values, grey areas - 95% total prediction uncertainty bands, dashed grey horizontal line cuts the RC extrapolation range, red lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RR parameters (scenario B), green lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RC parameters (scenario A)



S6 Predicted water levels in the Sluzew Creek using the posterior parameter distribution for the events #3 and #4. Dotted black lines present observations, solid blue lines illustrate predicted water levels corresponding to the mode posterior values, grey areas - 95% total prediction uncertainty bands, dashed grey horizontal line cuts the RC extrapolation range, red lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RR parameters (scenario B), green lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RC parameters (scenario A)



S7 Predicted water levels in the Sluzew Creek using the posterior parameter distribution for the event #8. Dotted black lines present observations, solid blue lines illustrate predicted water levels corresponding to the mode posterior values, grey areas - 95% total prediction uncertainty bands, dashed grey horizontal line cuts the RC extrapolation range, red lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RR parameters (scenario B), green lines – 95% limits for the predictive uncertainty bands whilst ignoring uncertainty in RC parameters (scenario A)