Supplementary material to "Bridging glacier and river catchment scales: an efficient representation of glacier dynamics in a hydrological model" by Wortmann et al.

October 7, 2016

1 Parameter sensitivity

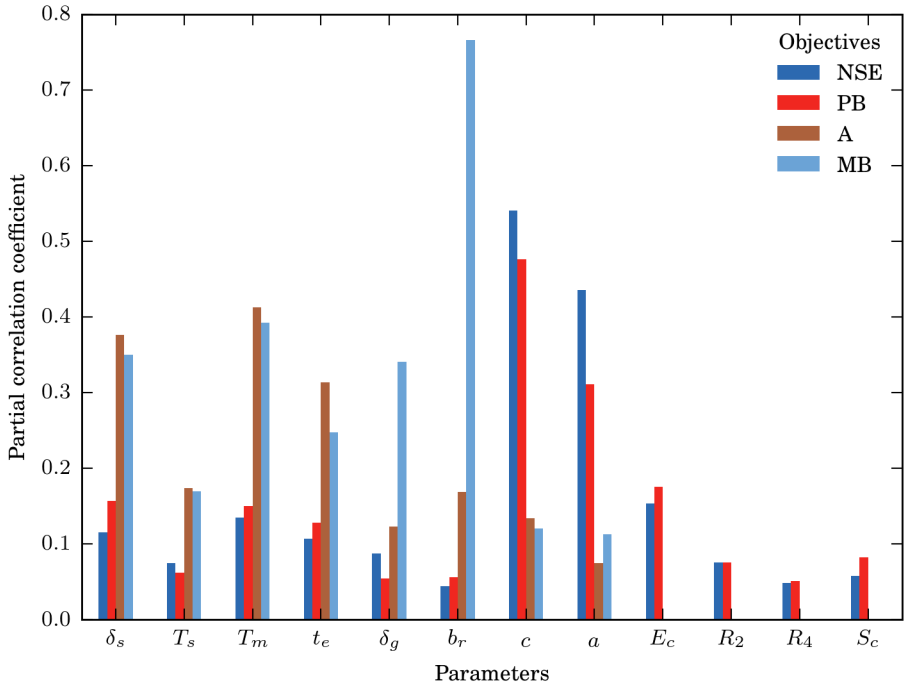

Figure 1: Calibration parameter sensitivity with regard to the four objective functions: Nash-Sutcliffe Efficiency (NSE), percentage bias in the water balance (PB), RMSE of the initialised glacier area hypsometry (A) and the RMSE of annual mass balance (MB). The parameters are with further details given in Table 1: δ_s (Snow Degree-Day factor), T_s, T_m (Snow fall and melt threshold temperatures), t_e (Temperature lapse rate), δ_g (Ice Degree-Day factor), b_r (Residual mass balance during initialisation), c and a (Maximum precipitation correction factor and maximum precipitation gradient, both only applied to the Aksu catchment), E_c (evaporation correction factor), R_2, R_4 (routing coefficients) and S_c (saturated conductivity correction). The partial correlation coefficient of the parameters over the 5000 calibration runs were averaged over all catchments. As the parameters E_c, R_2, R_4 and S_c have no impact on A and MB, the coefficients were excluded here.

2 Calibrated parameter values

Table 1: Calibrated parameters (min., median, max.) for both investigated catchments over the best 25 parameter sets. Refer to Table 1 for a description of the parameters.

Parameter	*Upper Aksu*			*Upper Rhone*		
	min	median	max	min	median	max
δ_s	0.32	0.38	0.41	0.27	0.40	0.50
T_s	2.2	3.3	3.8	-2.3	1.3	1.9
T_m	-2.0	-1.2	-0.7	-1.2	-0.5	1.6
t_e	-0.78	-0.72	-0.68	-0.60	-0.56	-0.49
δ_g	5.8	8.6	11.6	6.1	8.8	10.3
b_r	-281	-250	-182	-129	-79	149
c*	3.1	3.6	3.9			
a*	0.31	0.34	0.37			
E_c	0.61	0.79	1.15	0.74	1.08	1.41
R_2	0.5	1.1	3.1	1.3	3.8	5.0
R_4	0.9	2.7	4.1	1.6	4.6	5.0
S_c	0.6	1.2	1.9	1.0	1.3	1.7

*only used for the data-scarce Aksu catchment