

Supplement of Hydrol. Earth Syst. Sci. Discuss., 11, 10273–10317, 2014
<http://www.hydrol-earth-syst-sci-discuss.net/11/10273/2014/>
doi:10.5194/hessd-11-10273-2014-supplement
© Author(s) 2014. CC Attribution 3.0 License.



Supplement of

Calibration approaches for distributed hydrologic models using high performance computing: implication for streamflow projections under climate change

S. Wi et al.

Correspondence to: S. Wi (sungwookwi@gmail.com)

872 **Supplementary materials**

a)



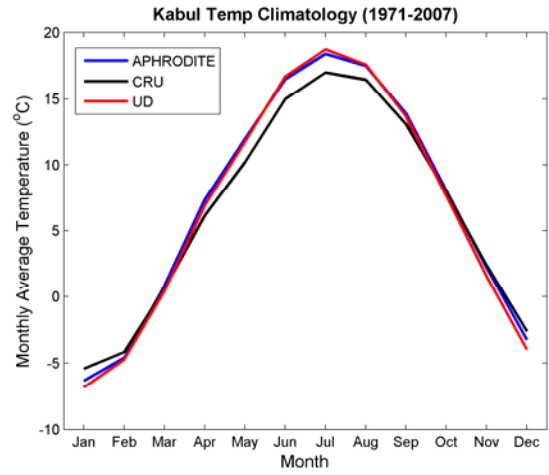
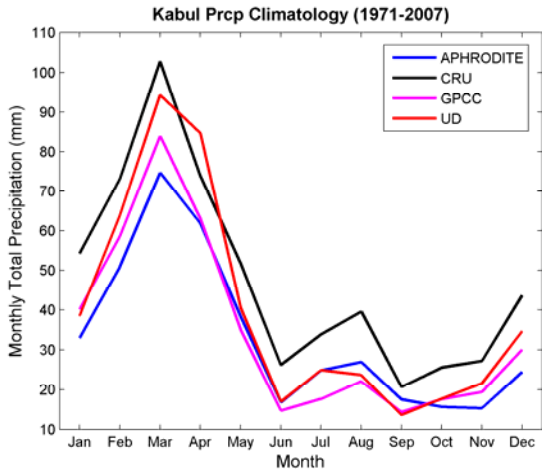
b)



873

874 Figure S1. (a) Sub-basins corresponding to five gaging stations are used for the multisite
875 calibrations. (b) Two sub-basins (Kama and Asmar) are assumed to be ungaged and used for
876 evaluating the calibration approaches.

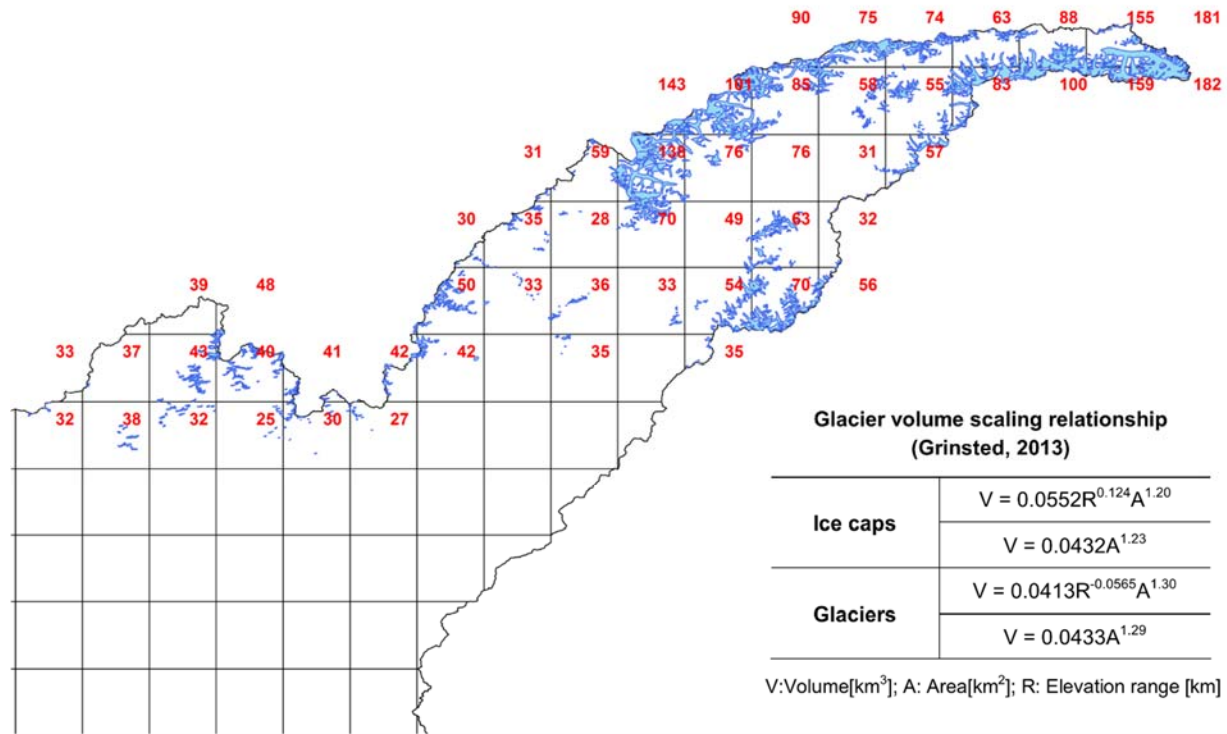
877



878

879 Figure S2. Comparison of climatology of basin-wise monthly precipitation and temperature for
 880 the Kabul River basin.

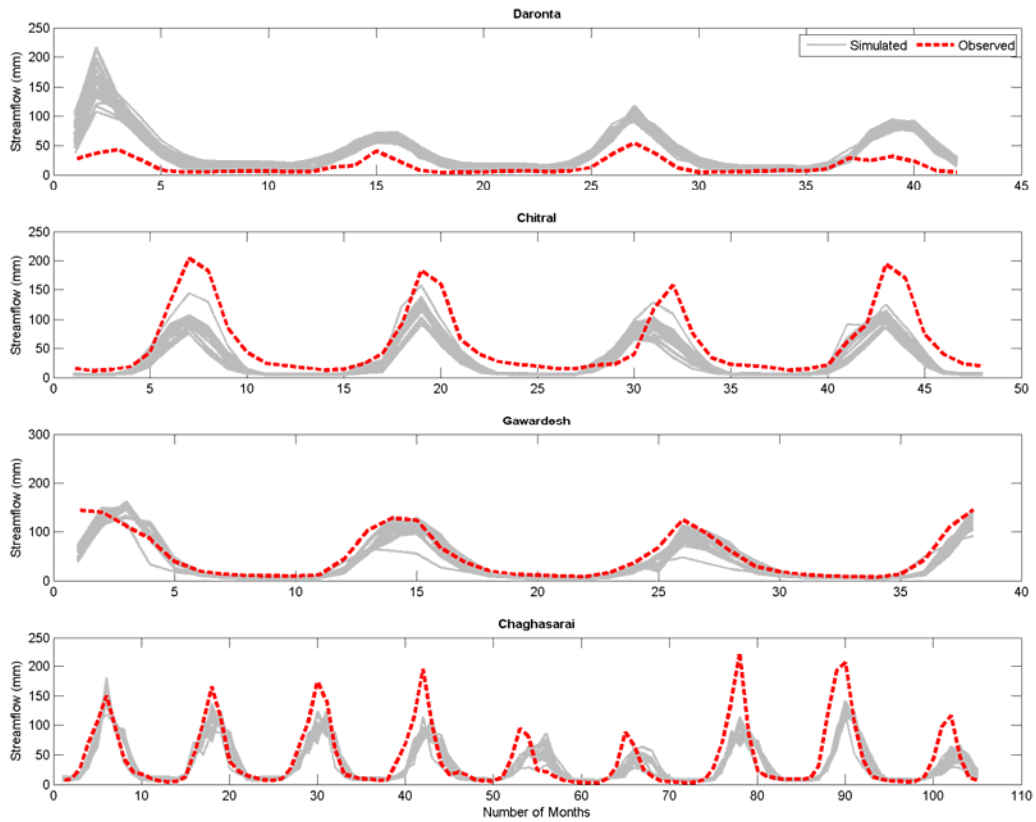
881



882

883 Figure S3. Glacial coverage in the Kabul River basin based on the Randolph Glacier Inventory
 884 version 3.2. Glacier volume scaling relationship proposed by Grinsted (2013) is applied to derive
 885 glacier volume. Numbers in red represent glacier depths in meter of water for grid cells
 886 containing glaciers.

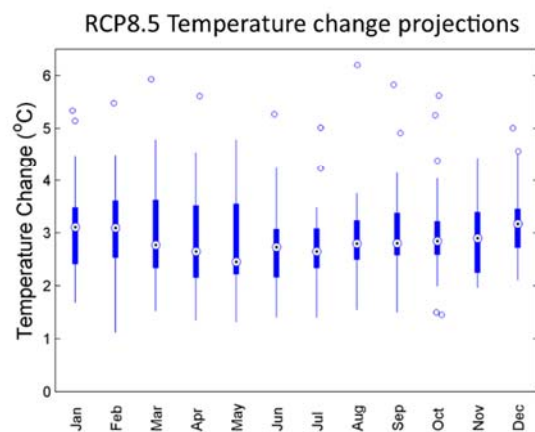
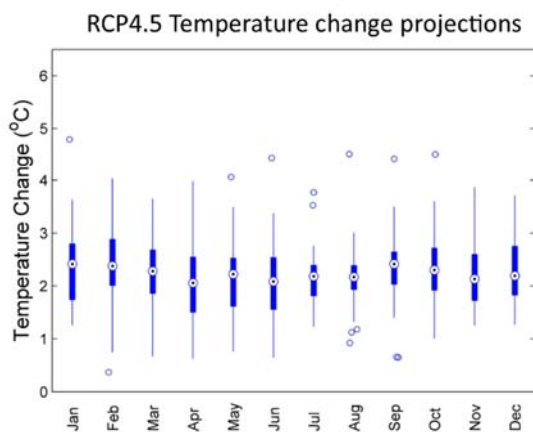
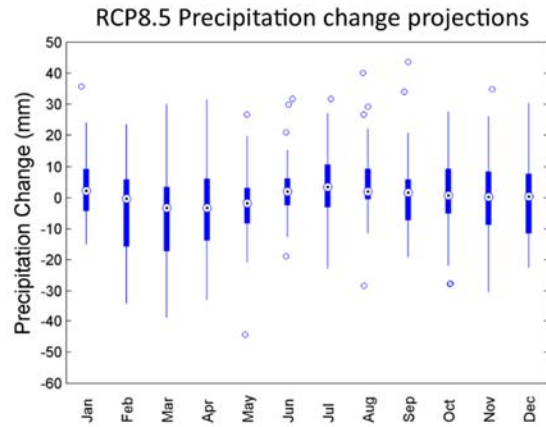
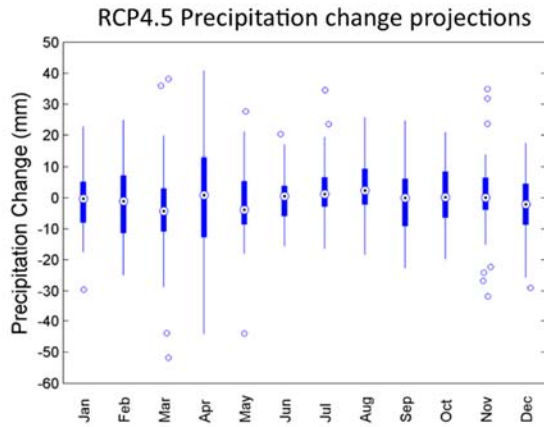
887



888

889 Figure S4. HYMOD_DS streamflow simulations at sub-basins from 50 trials of the basin outlet
 890 calibration under the lumped parameterization.

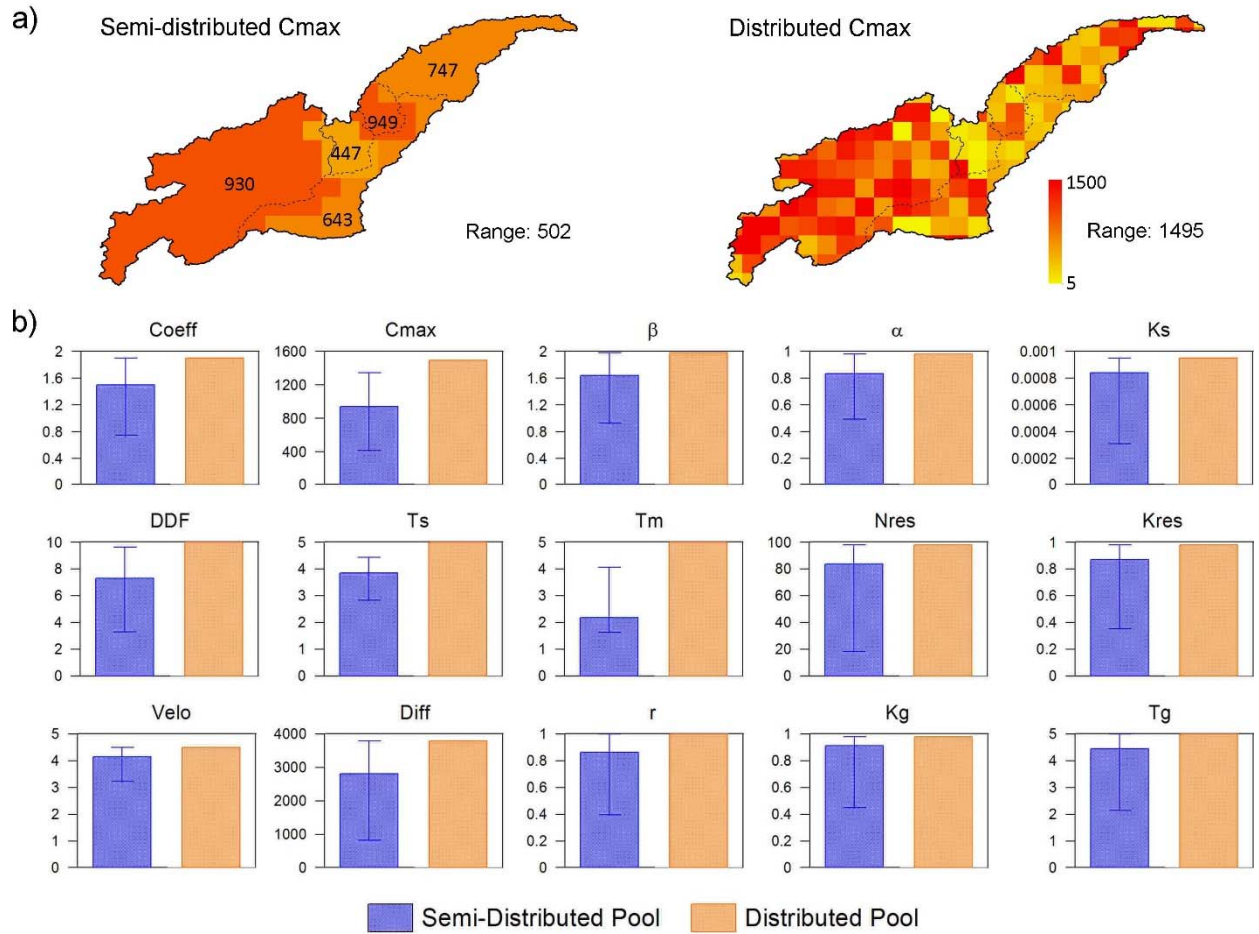
891



892

893 Figure S5. CMIP5 climate change projections of precipitation and temperature for the Kabul
 894 basin. The changes in climatology of monthly total precipitation and mean temperature for the
 895 future period 2050s (2036-2065) were calculated from the comparison with the historical period
 896 (1976-2005). 36 GCMs were employed in this analysis.

897

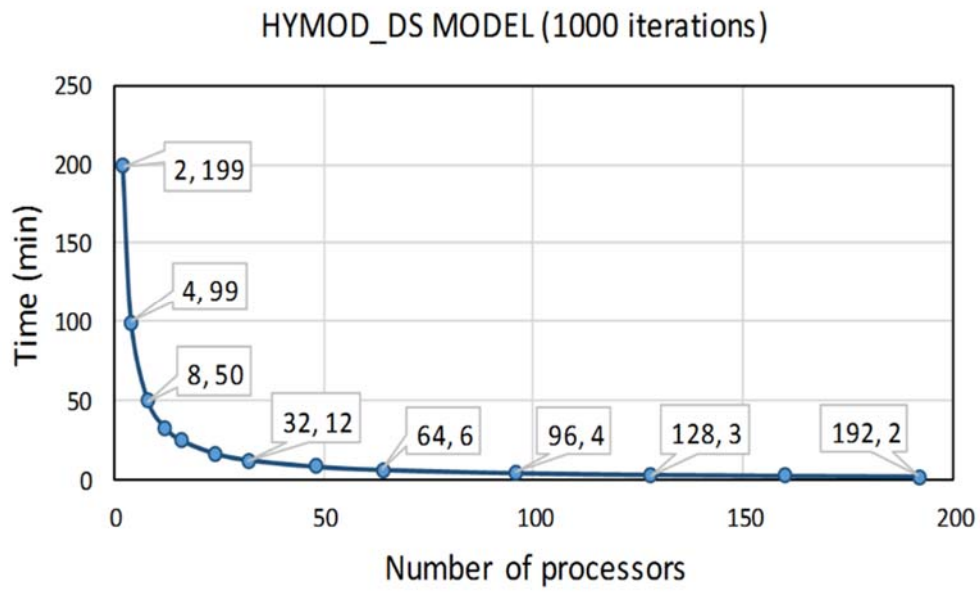


898

899 Figure S6. Spatial variability of the HYMOD_DS parameters. a) An example with C_{max} showing
 900 parameter ranges resulting from the single trail of Semi-Pooled and Dist-Pooled. b) Average
 901 spatial variability across 50 trials of calibration for all 15 parameters. Error bar in b) represents
 902 the range of parameter spatial variability from the 50 trials.

903

904



905

906

Figure S7. HYMOD_DS run time on parallel computing system.

907