Supplementary Material

Quantifying parameter uncertainty in a large-scale glacier evolution model with a Bayesian model – Application to High Mountain Asia

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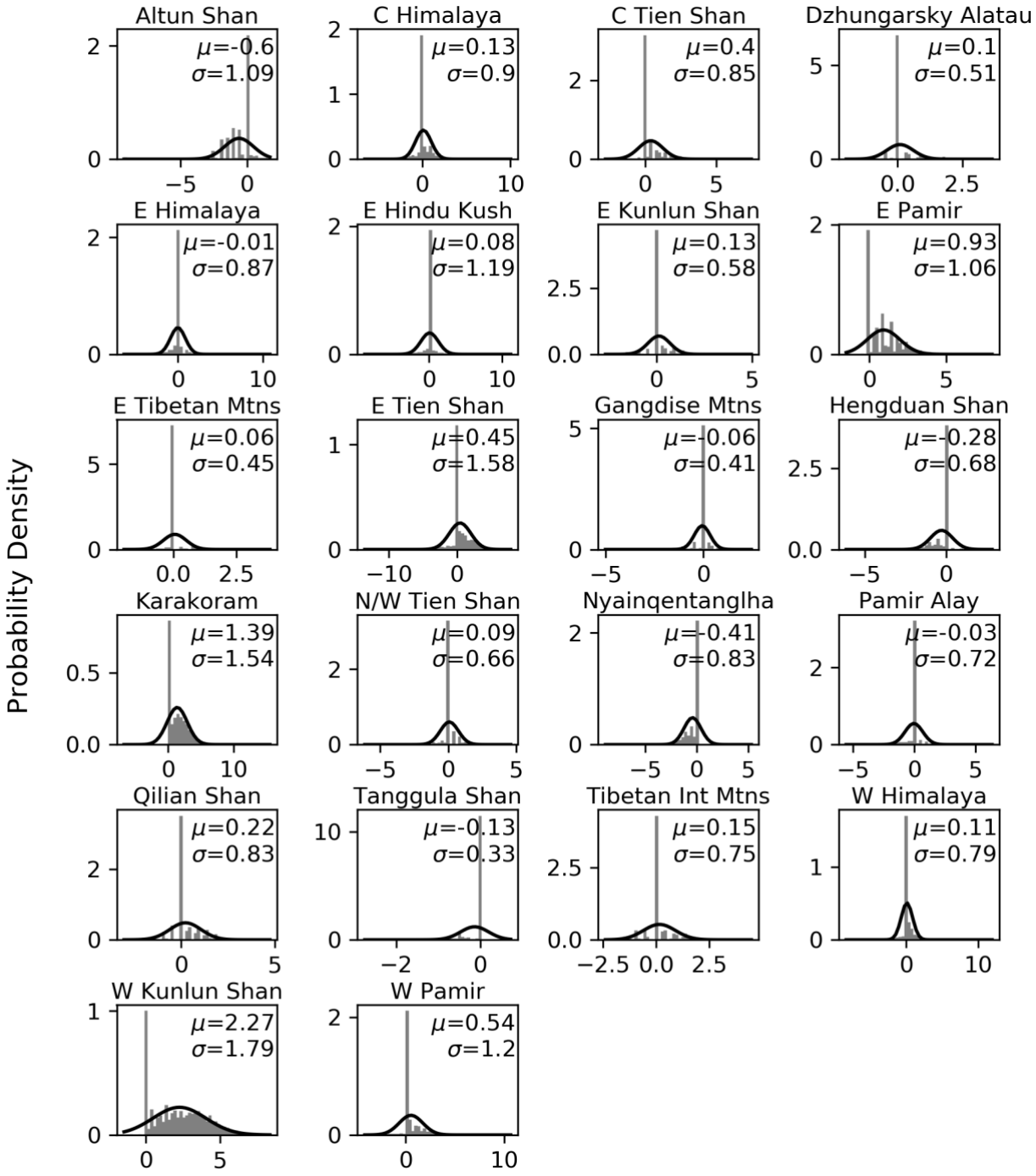

Figure S1. Marginal prior distribution for the temperature bias for each region (black) assuming a gamma distribution based on the mean and standard deviation from the results of the simplified optimization scheme (grey).

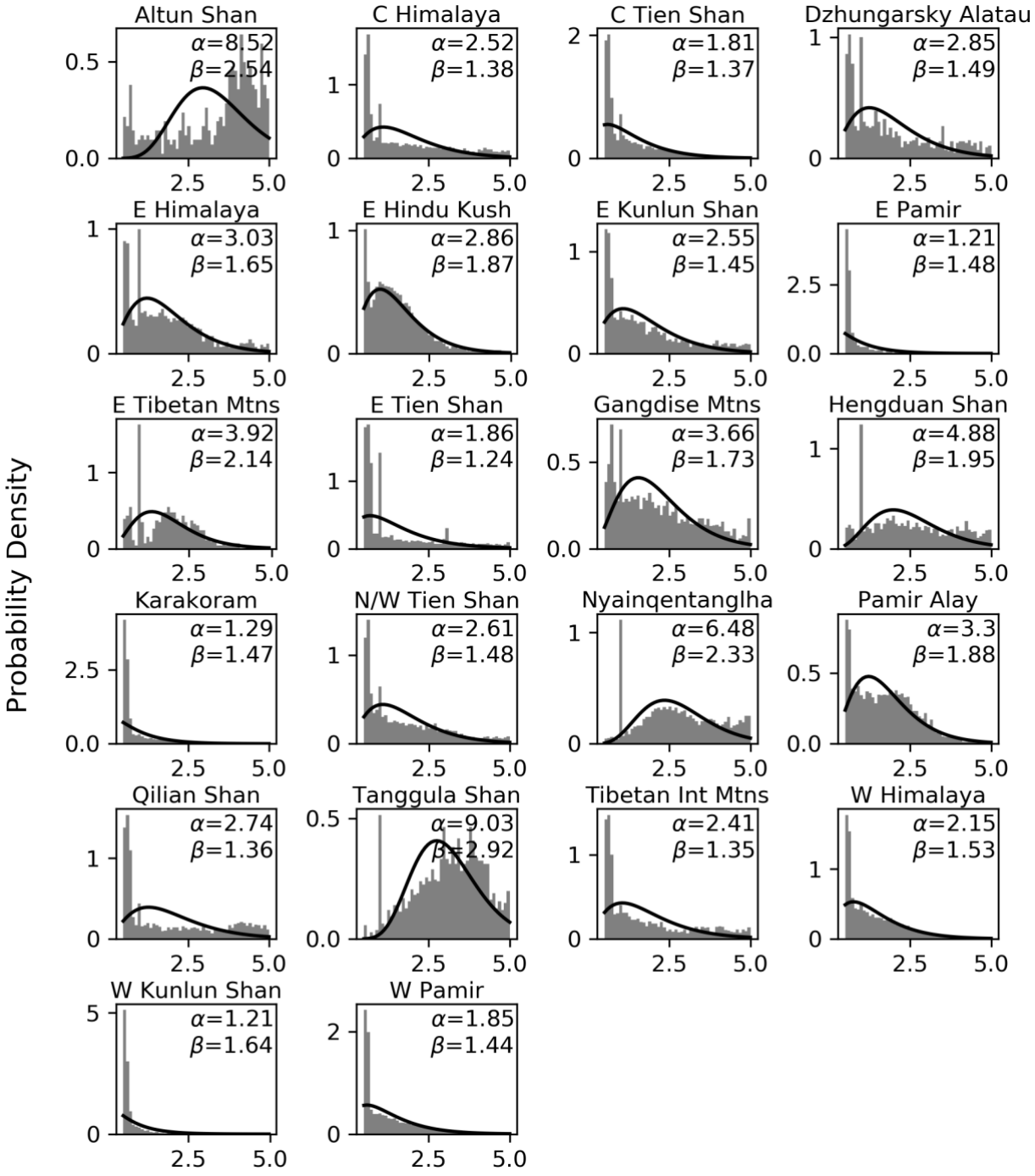

Figure S2. Marginal prior distribution for the precipitation factor for each region (black) assuming a gamma distribution based on the mean and standard deviation from the results of the simplified optimization scheme (grey).

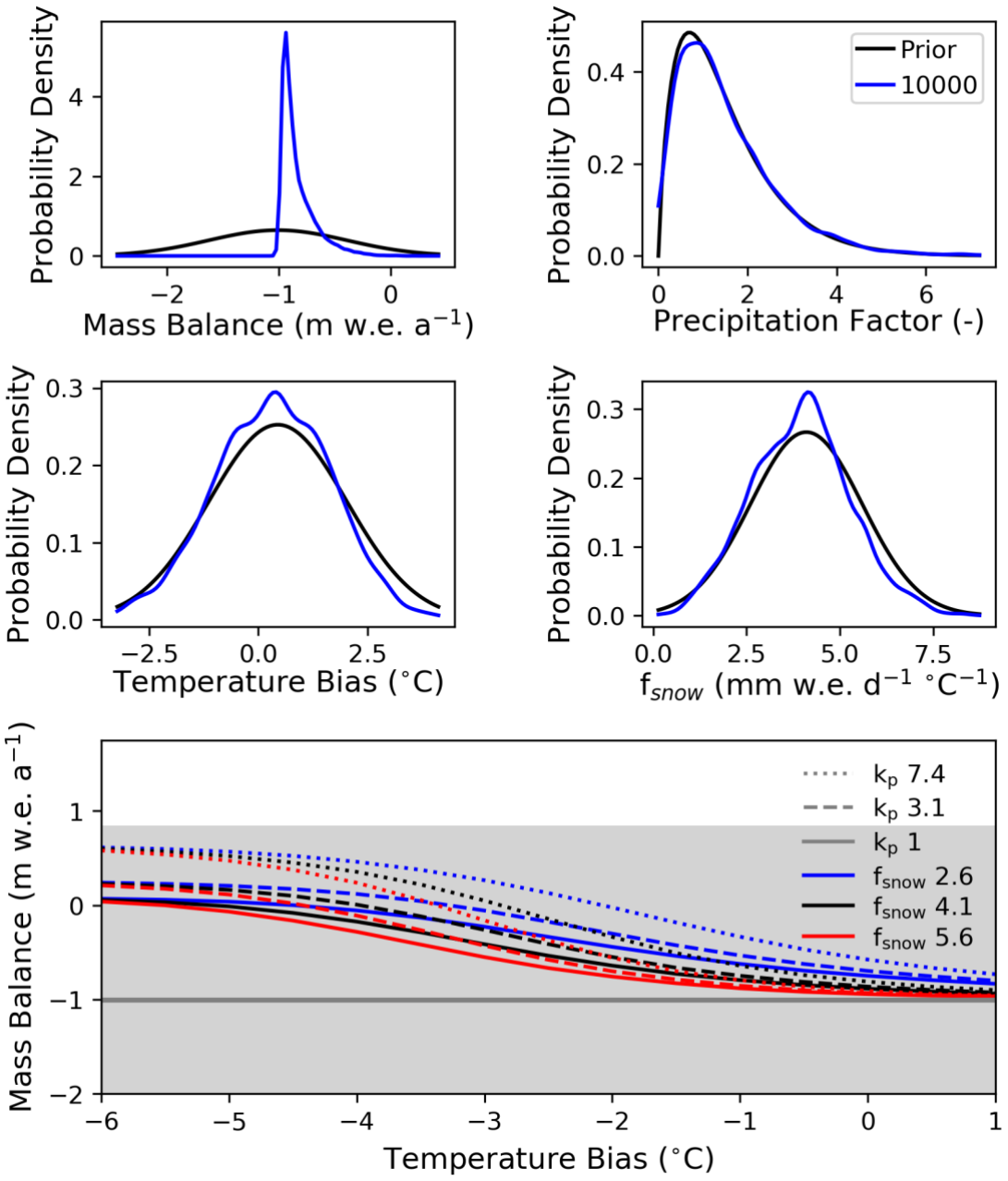

Figure S3. Observed and predictive posterior distribution for the mass balance along with prior and posterior distributions for the precipitation factor, temperature bias, and degree day factor of snow (f_{snow}) for glacier RGI60-13.45048 for a single chain of 10,000 steps, and subplot showing the mass balance versus model parameters.

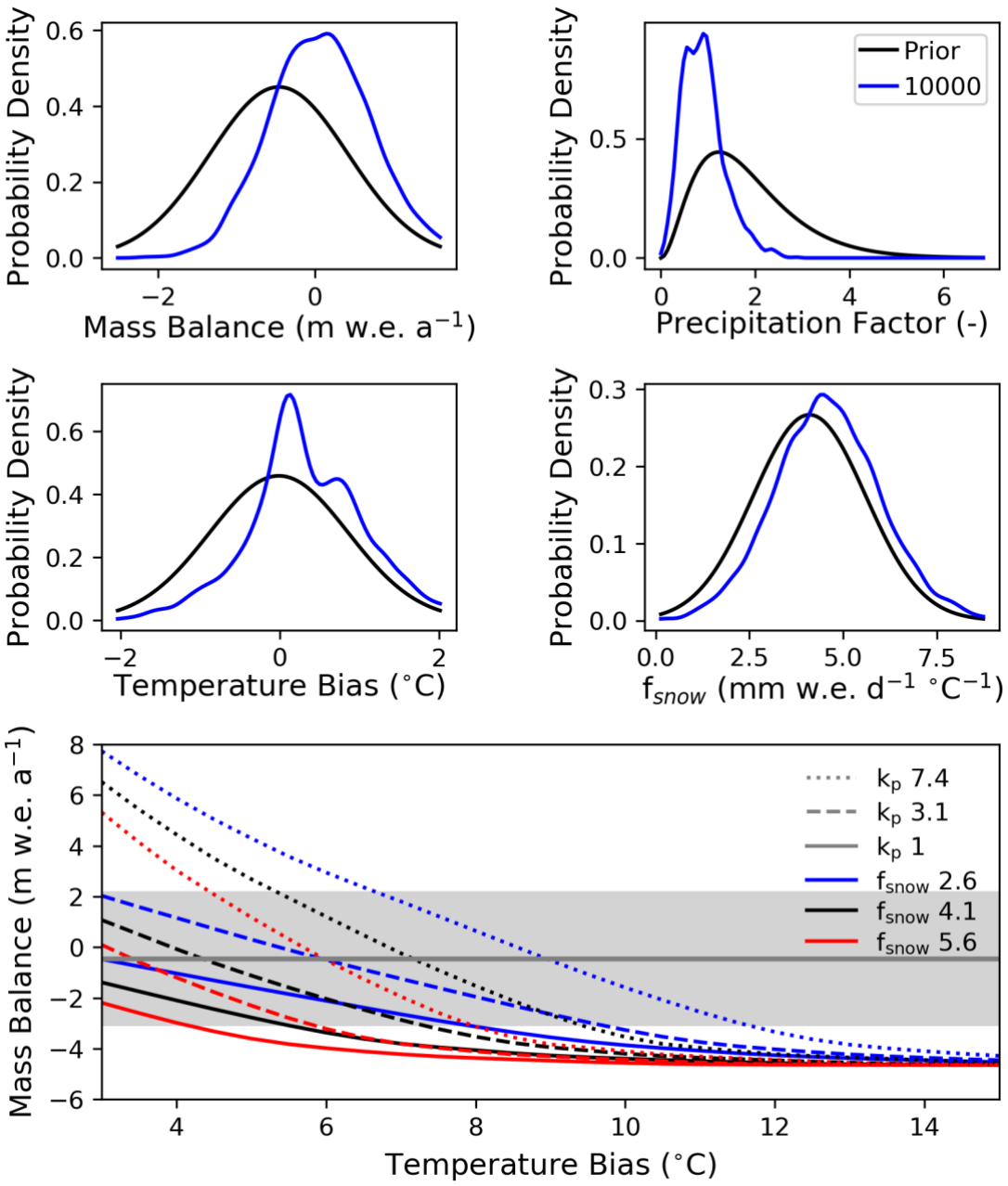

Figure S4. Observed and predictive posterior distribution for the mass balance along with prior and posterior distributions for the precipitation factor, temperature bias, and degree day factor of snow (f_{snow}) for glacier RGI60-15.10755 for a single chain of 10,000 steps, and subplot showing the mass balance versus model parameters.

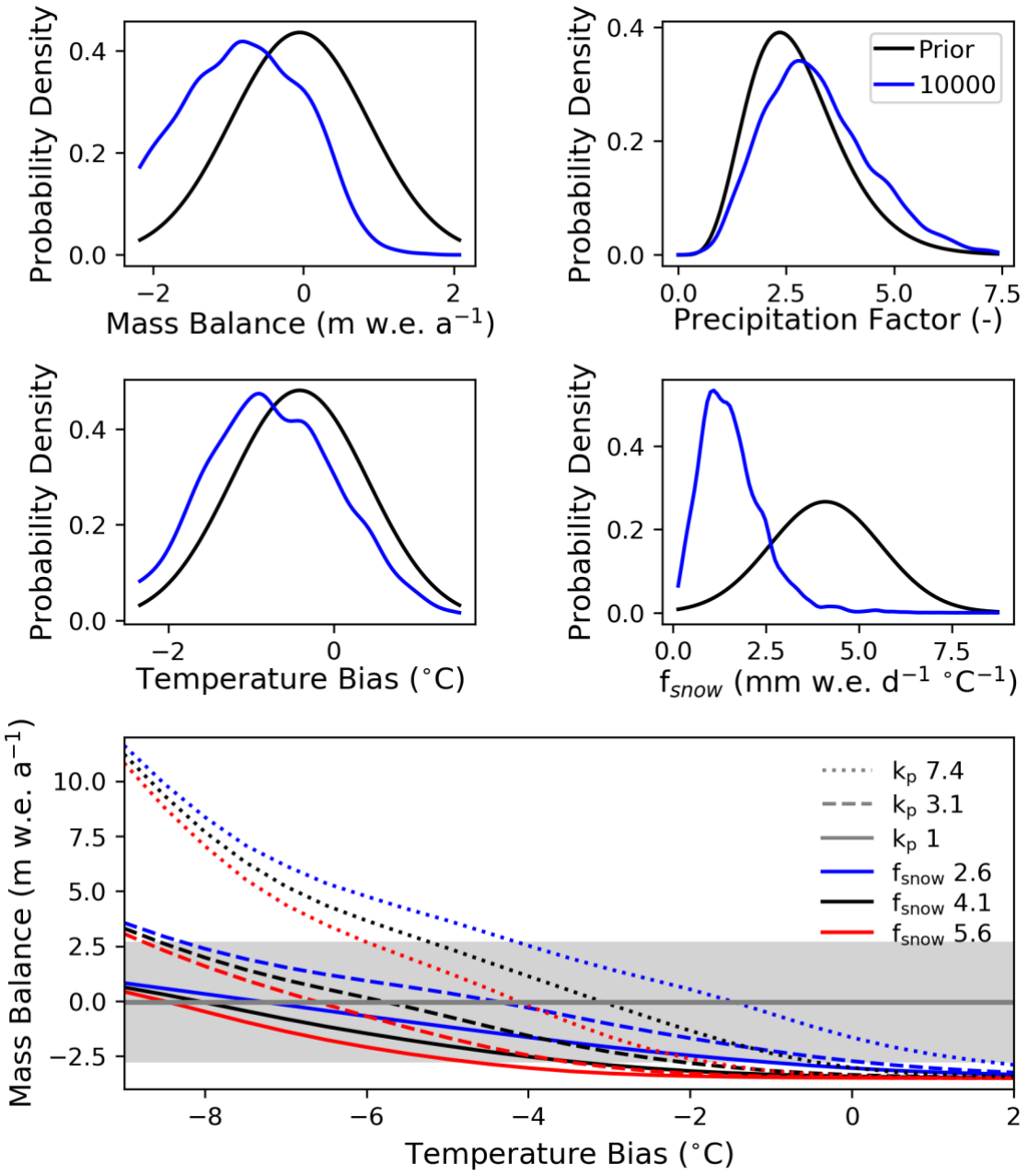

Figure S5. Observed and predictive posterior distribution for the mass balance along with prior and posterior distributions for the precipitation factor, temperature bias, and degree day factor of snow (f_{snow}) for glacier RGI60-15.12457 for a single chain of 10,000 steps, and subplot showing the mass balance versus model parameters.

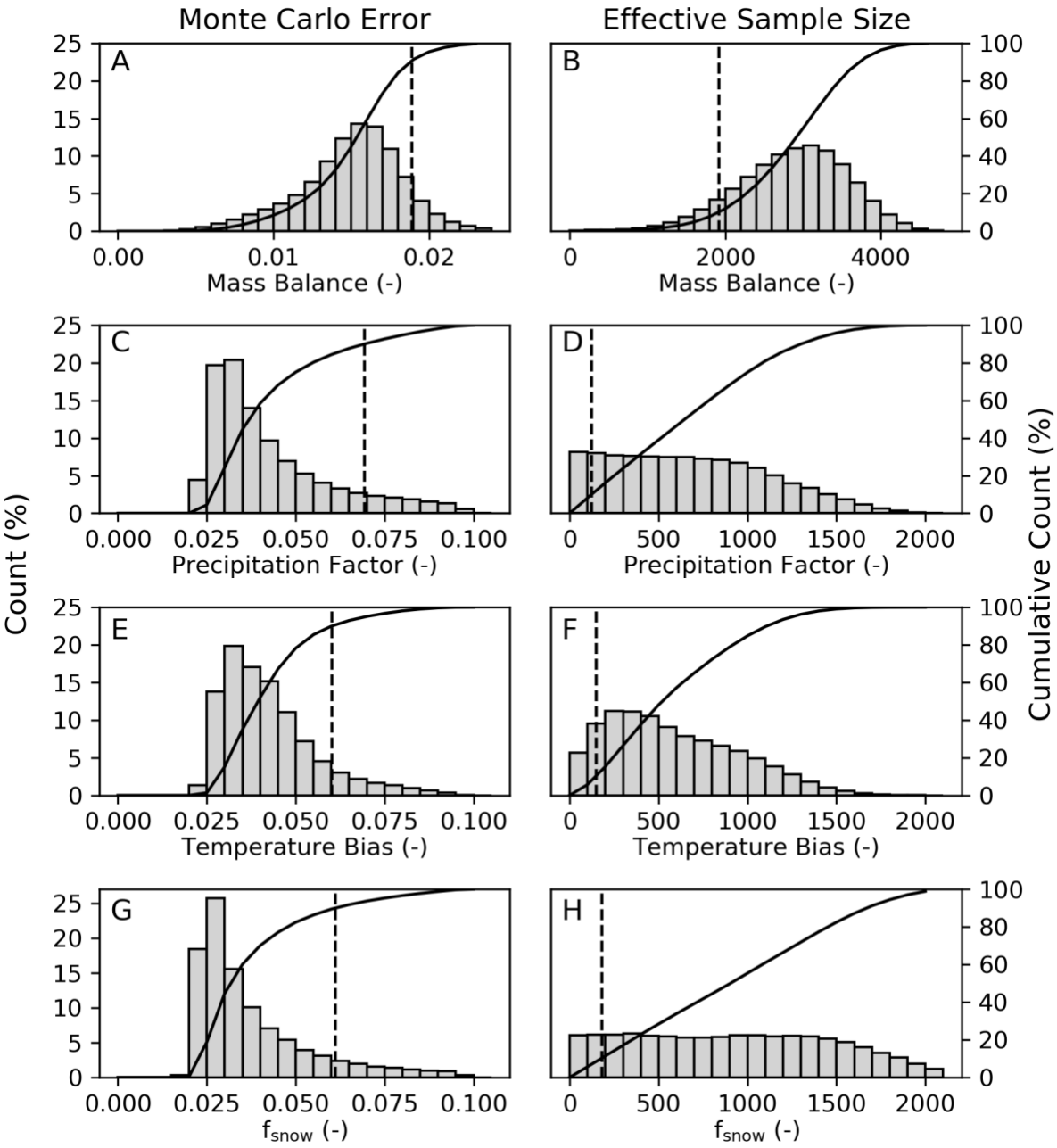

Figure S6. Histogram and cumulative percentage of Monte Carlo error and effective sample size for the mass balance (A,B), precipitation factor (C,D), temperature bias (E,F), and degree-day factor of snow (f_{snow}) (G,H) for all the glaciers in High Mountain Asia. Solid black lines show the cumulative percentages, and dashed black lines show the 90-percentile value for Monte Carlo error and 10-percentile value for effective sample size. The Monte Carlo error is normalized by the standard deviation of the posterior distribution.

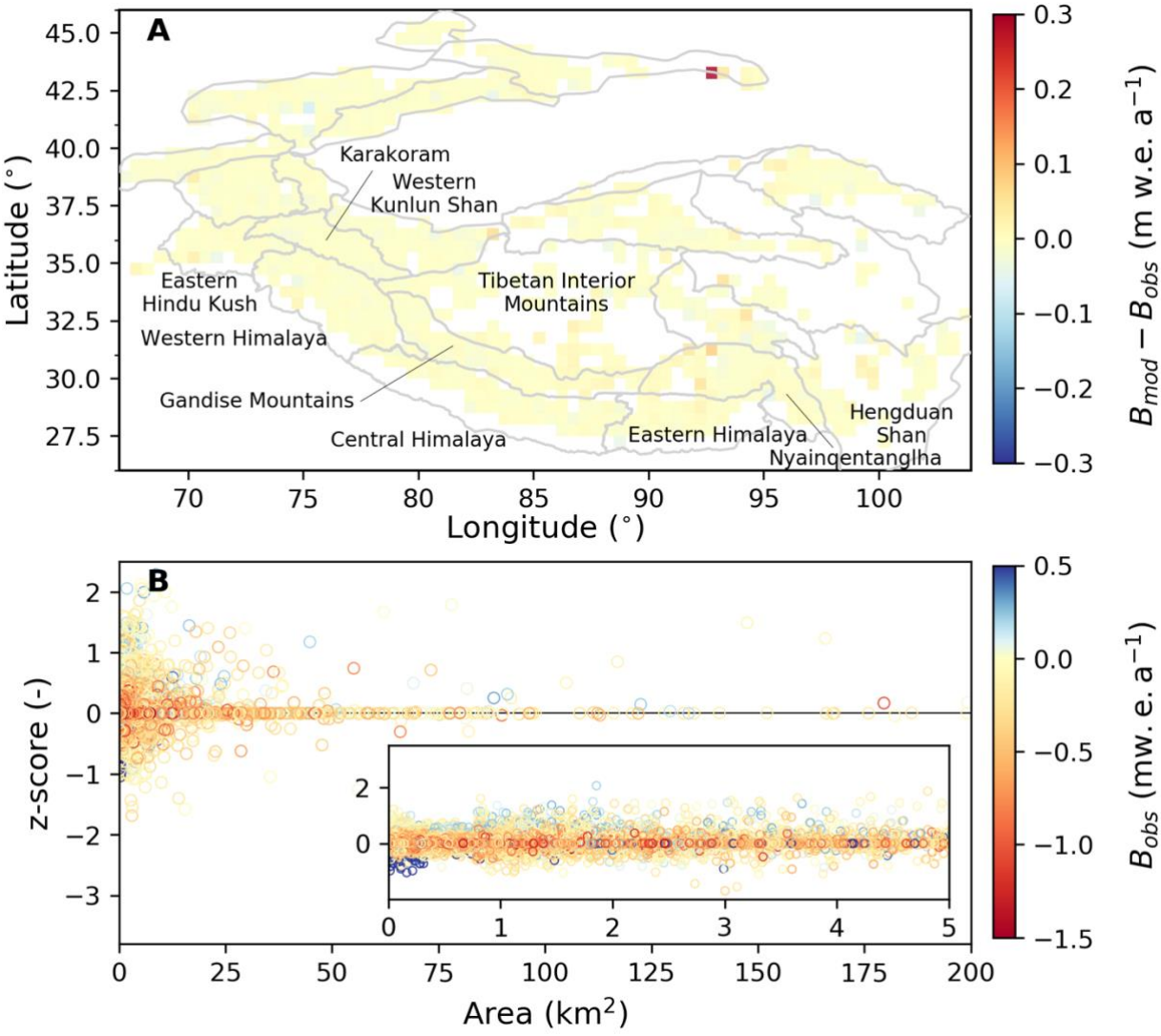

Figure S7. The difference between the observed (B_{obs}) and mean (B_{mod}) mass balance (A) showing the spatial distribution aggregated to 0.5° grids and (B) as a function of glacier area for every glacier in High Mountain Asia using the calibration scheme of Huss and Hock (2015). Grey outlines show 22 subregions from Bolch and others (2019).