

Supplement of
Supra-glacial debris cover changes in the Greater Caucasus from 1986 to 2014

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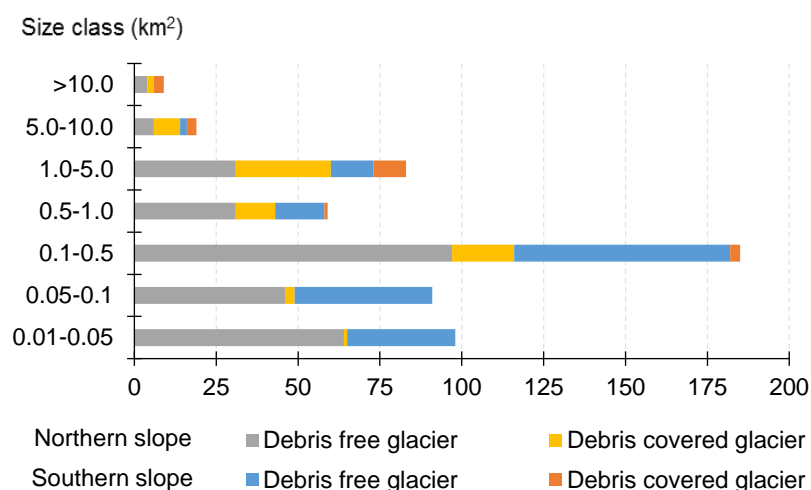


Figure S1. The Greater Caucasus glacier size classes with debris-covered and debris-free glaciers distributions for northern and southern slopes.

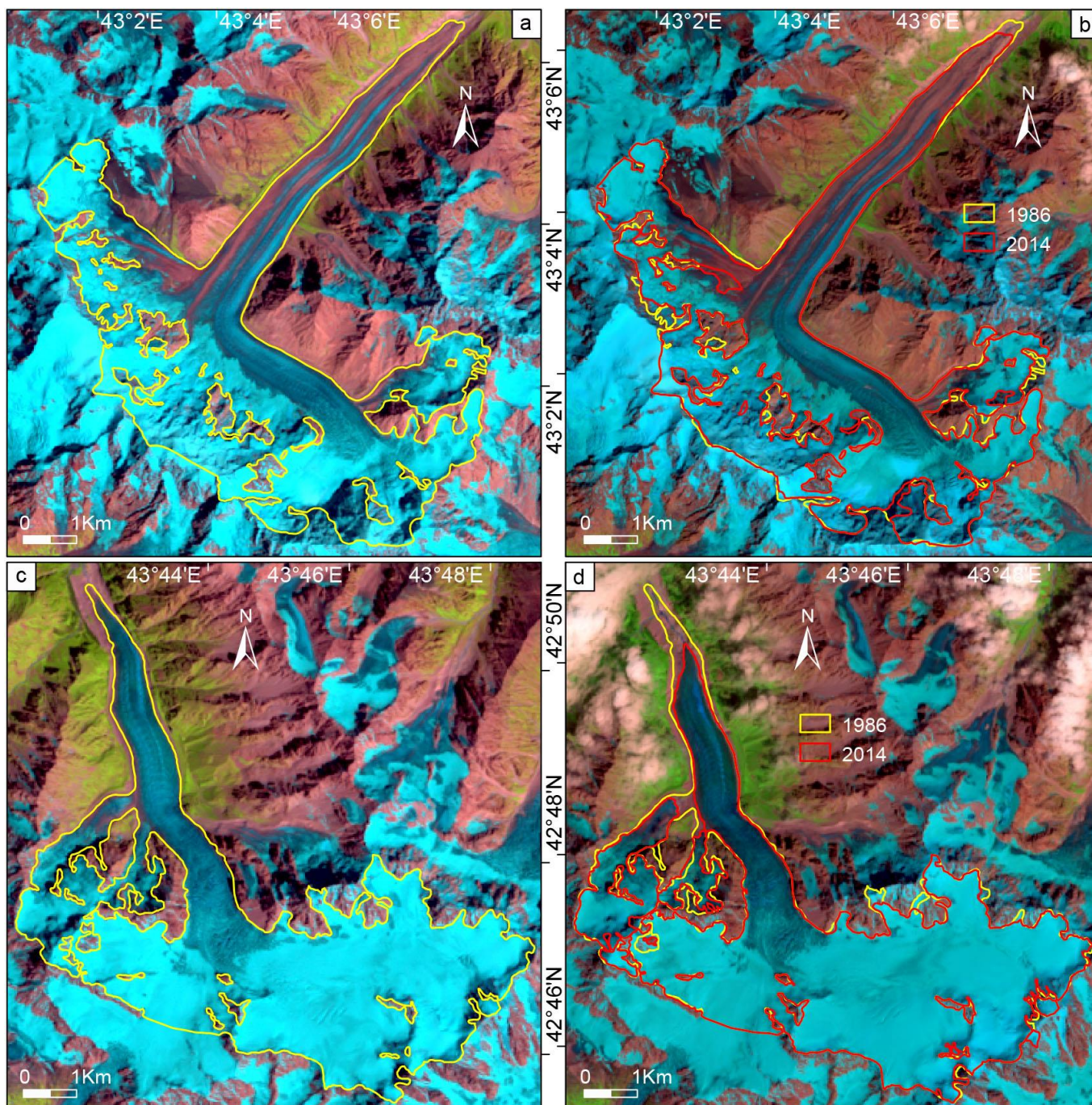


Figure S2. Debris-covered Bezingi Glacier retreat between 1986 (a) and 2014 (b); Debris-free Karaugom Glacier retreat between 1986 (c) and 2014 (d).

Table S1. Mean upper limit (m asl) of the supra-glacial debris cover for 1986 and 2014 by regions (glaciers are non-existent on southern slopes of the eastern Greater Caucasus).

Name	Elevation, (m asl) 1986	Elevation, (m asl) 2014
N slope of Western Caucasus	2809	2894
S slope of Western Caucasus	2723	2848
Both slopes of Western Caucasus	2766	2871
N slope of Central Caucasus	3108	3179
S slope of Central Caucasus	2839	3013
Both slopes of Central Caucasus	2974	3096
N slope of Eastern Caucasus	3538	3626
Elbrus	3343	3521
Total	3015	3130

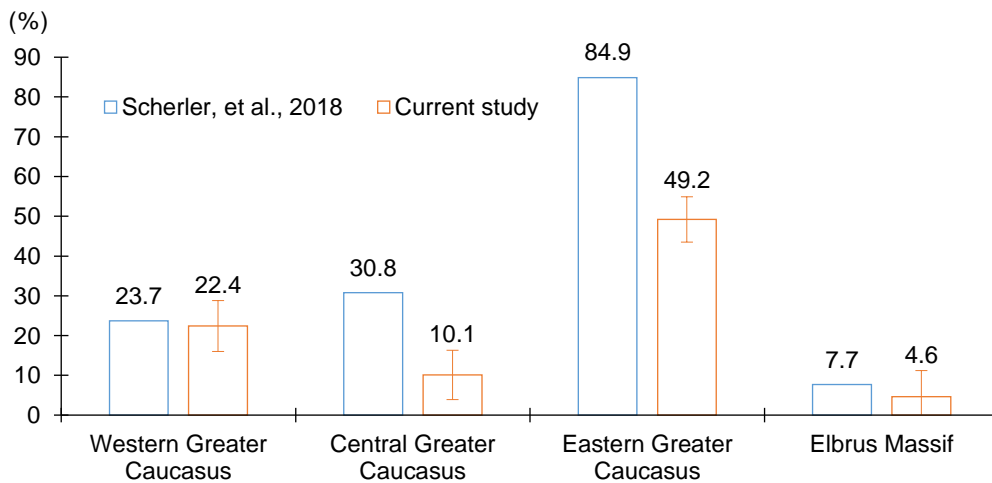


Figure S3. Relative supra-glacial debris cover for the western, central, and eastern Greater Caucasus as well as for Elbrus based on the current study, and in comparison to Scherler et al. (2018).

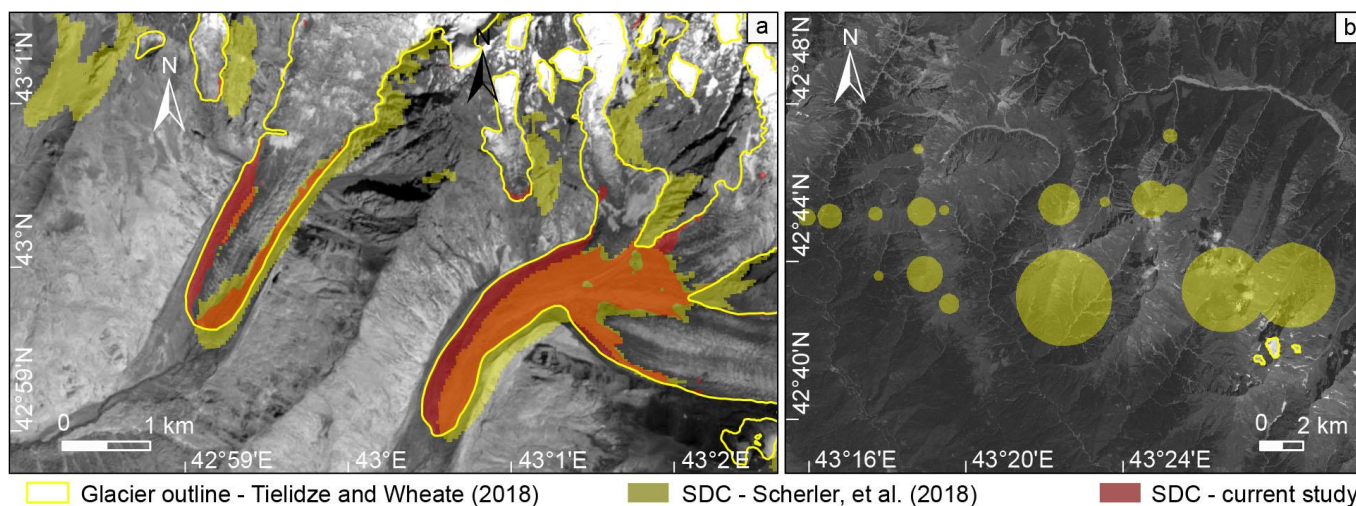


Figure S4. a - Comparison of supra-glacial debris cover (SDC) assessment by Scherler, et al. (2018) (based on the RGI v6) and current study. b - An example of the RGI v6 nominal glaciers (circles). According to Scherler et al. (2018), all nominal glaciers were classified as debris-covered. Landsat 8 (panchromatic band 8), 03/08/14 is shown in the background.

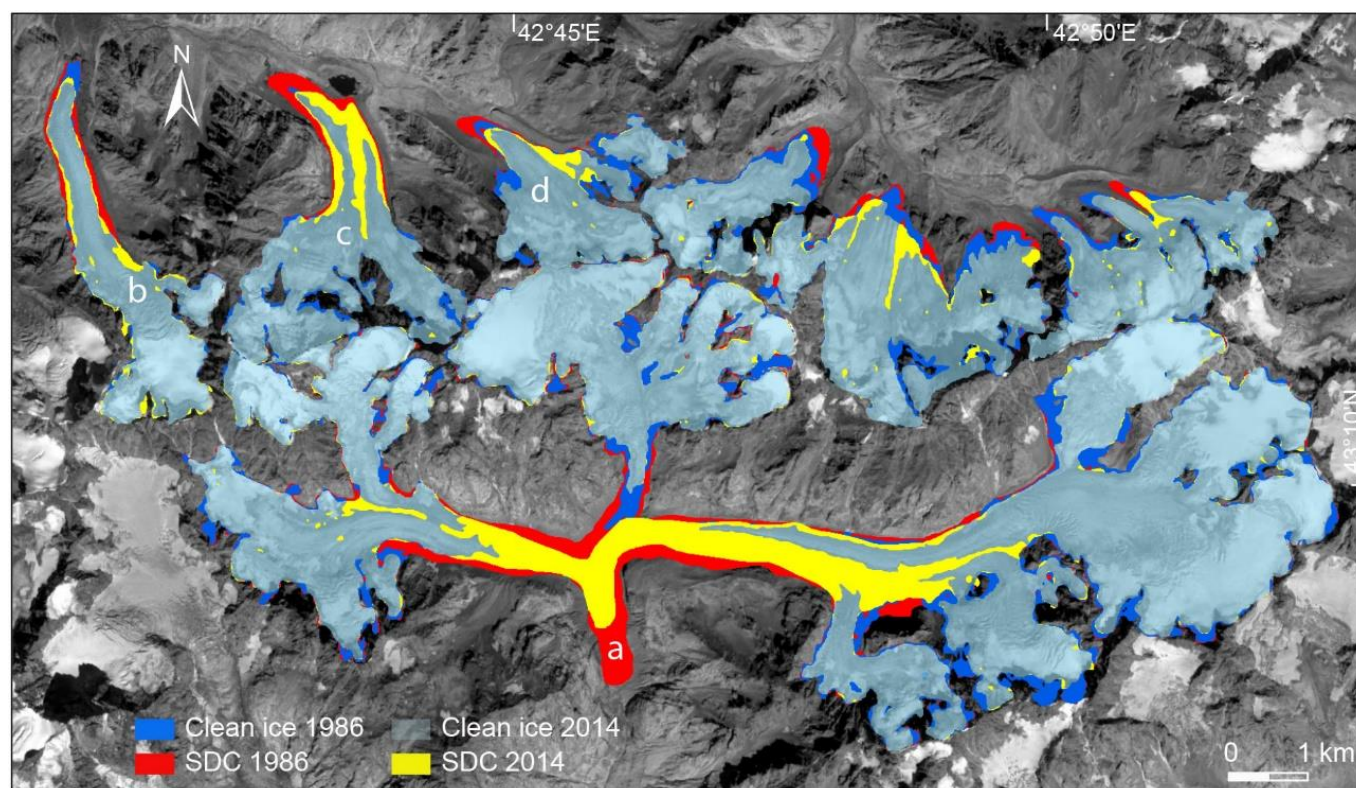


Figure S5. Supra-glacial debris cover (SDC) and clean-ice area change in 1986-2014 for the southern (a – Lekhzi) and northern-facing (b – Kashkatash, c – Bashkara, and d – Djankuat) glaciers. Landsat 8 (panchromatic band 8), 03/08/14 is shown in the background. Clean-ice in 1986 consists of the clean-ice 2014 (light blue, transparent) plus clean-ice area that retreated between 1986 and 2014 (dark blue).

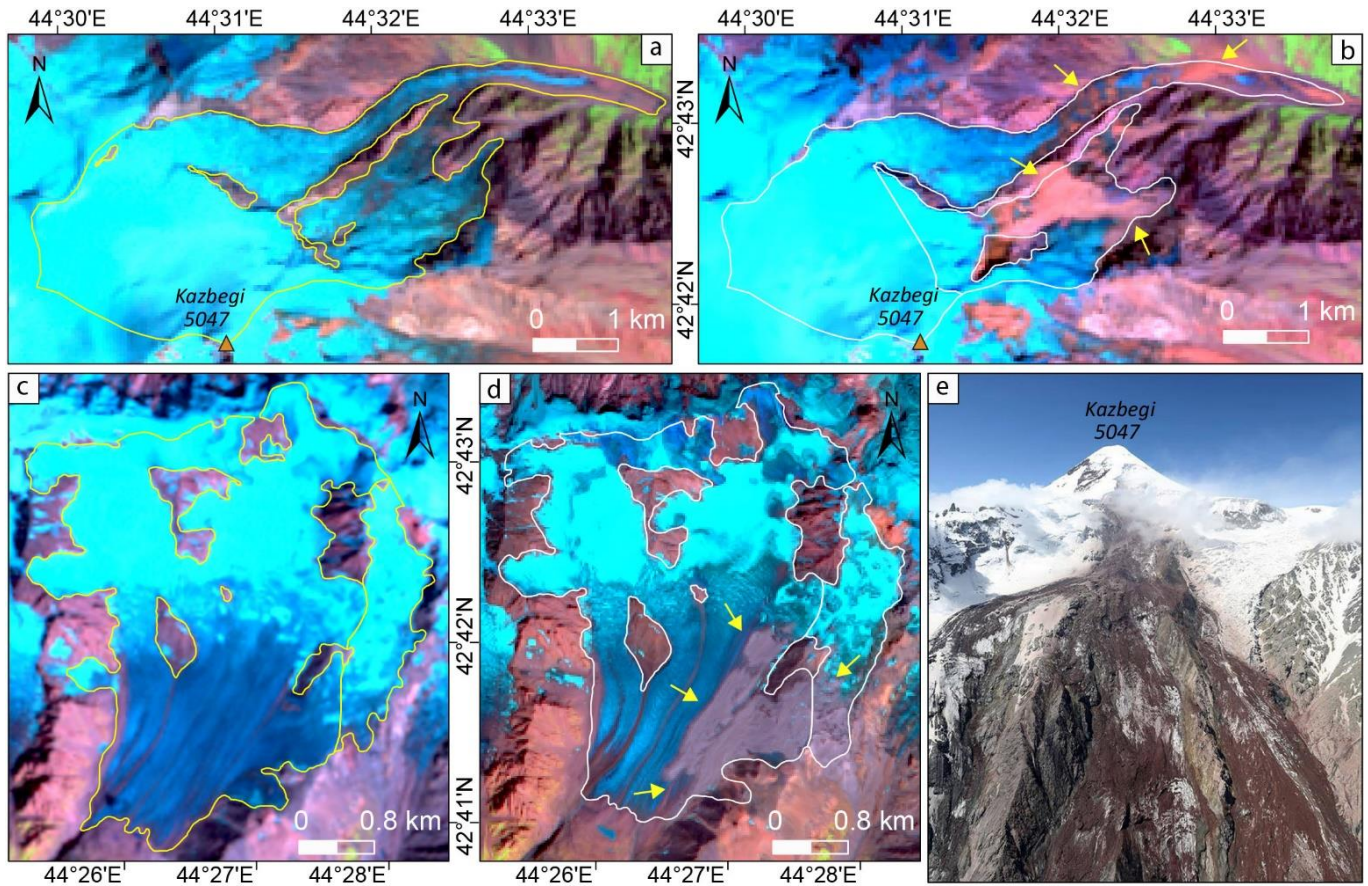


Figure S6. a – Devdoraki Glacier in 2000 (Landsat 7, 28/07/00); b – Devdoraki Glacier after rock-ice avalanche in 2014 (Landsat 8, 28/08/14). c – Suatisi Glacier in 2000 (Landsat 7, 28/07/00); d – Suatisi Glacier in 2014 (Landsat 8, 03/08/14). Yellow arrow shows increased supra-glacial debris cover area. e – Devdoraki Glacier oblique image showing increased supra-glacial debris cover area after rock-ice avalanche (18/04/14).