

Supplementary Table S1. Details of ASTER data

Date	ASTER data ID	Location of image centre	Quality
25 Oct. 2004	ASTL1A 0410250458240411040498	27.843802°N, 86.494104°E	Good
10 Nov. 2004	ASTL1A 0411100458190411210131	27.811015°N, 86.722839°E	Good
28 May 2005*	ASTL1A 0505280504530505310448	28.151466°N, 86.603573°E	Good
28 May 2005*	ASTL1A 0505280505020505310449	27.620051°N, 86.463317°E	Good
29 Nov.2005	ASTL1A 0511290458400512020077	27.804141°N, 86.773017°E	Bad
6 Dec. 2005	ASTL1A 0512060504480512090573	27.646678°N, 86.289759°E	Bad
1 Feb. 2006	ASTL1A 0602010458090602040117	27.820009°N, 86.663070°E	Good
19 Jan. 2007	ASTL1A 0701190459340701220148	27.837430°N, 86.540530°E	Bad
23 Feb. 2008	ASTL1A 0802230459310903220613	27.830978°N, 86.586113°E	Bad

\*Two images are merged into one mosaic image.

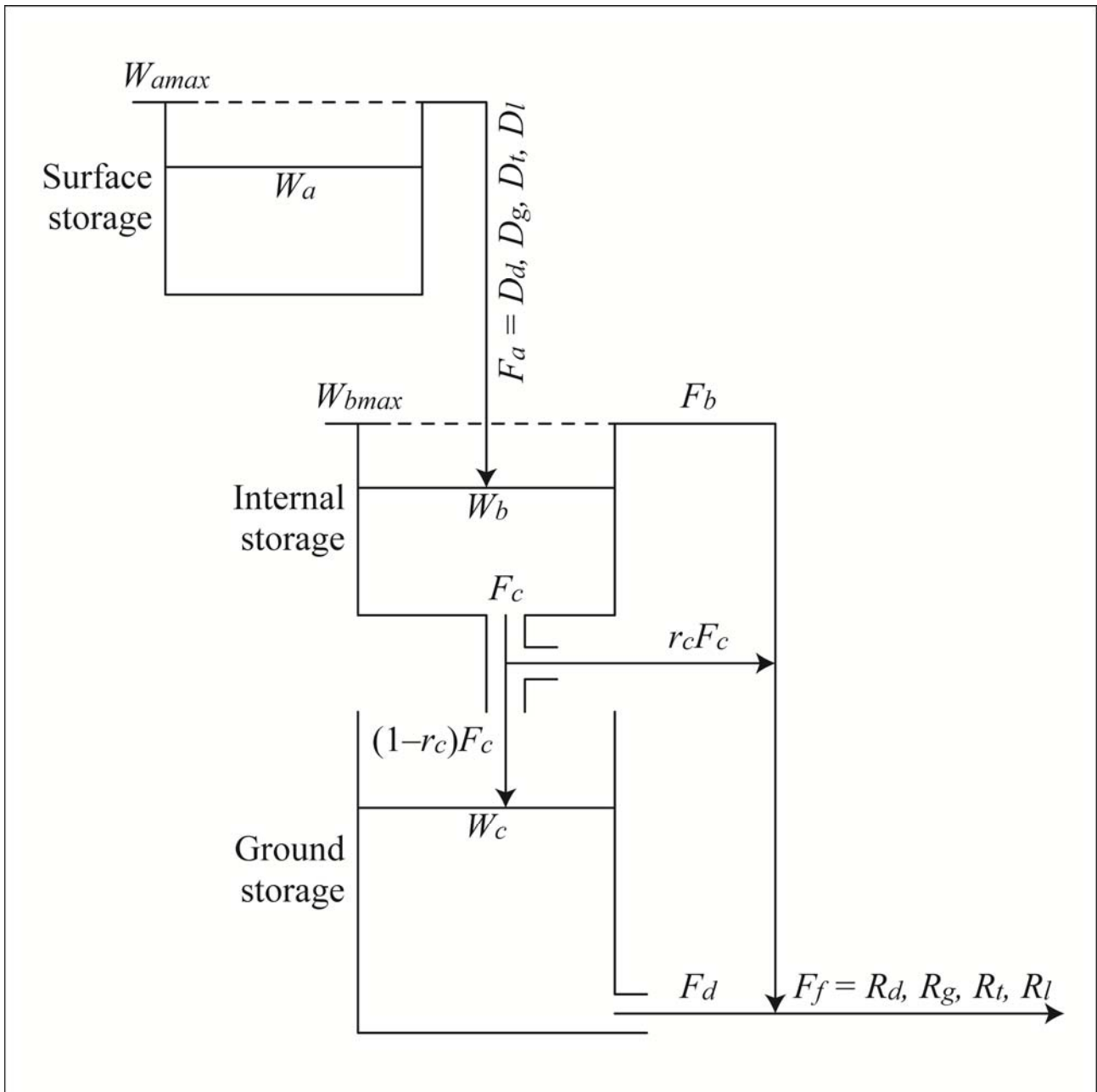


Figure S1. Schematic diagram of the bucket model used in this study (modified after Motoya and Kondo, 1999). Surface storage is used to calculate energy and water balance of the ice-free terrain (see the Sect. 2.3.3). Internal and ground storages are used to calculate final daily runoffs for the individual components such as the debris-covered surface ( $R_d$ ), the debris-free glacier ( $R_g$ ), the ice-free terrain ( $R_t$ ), and the lake ( $R_l$ ). Parameters are described in Section 2.3.5.

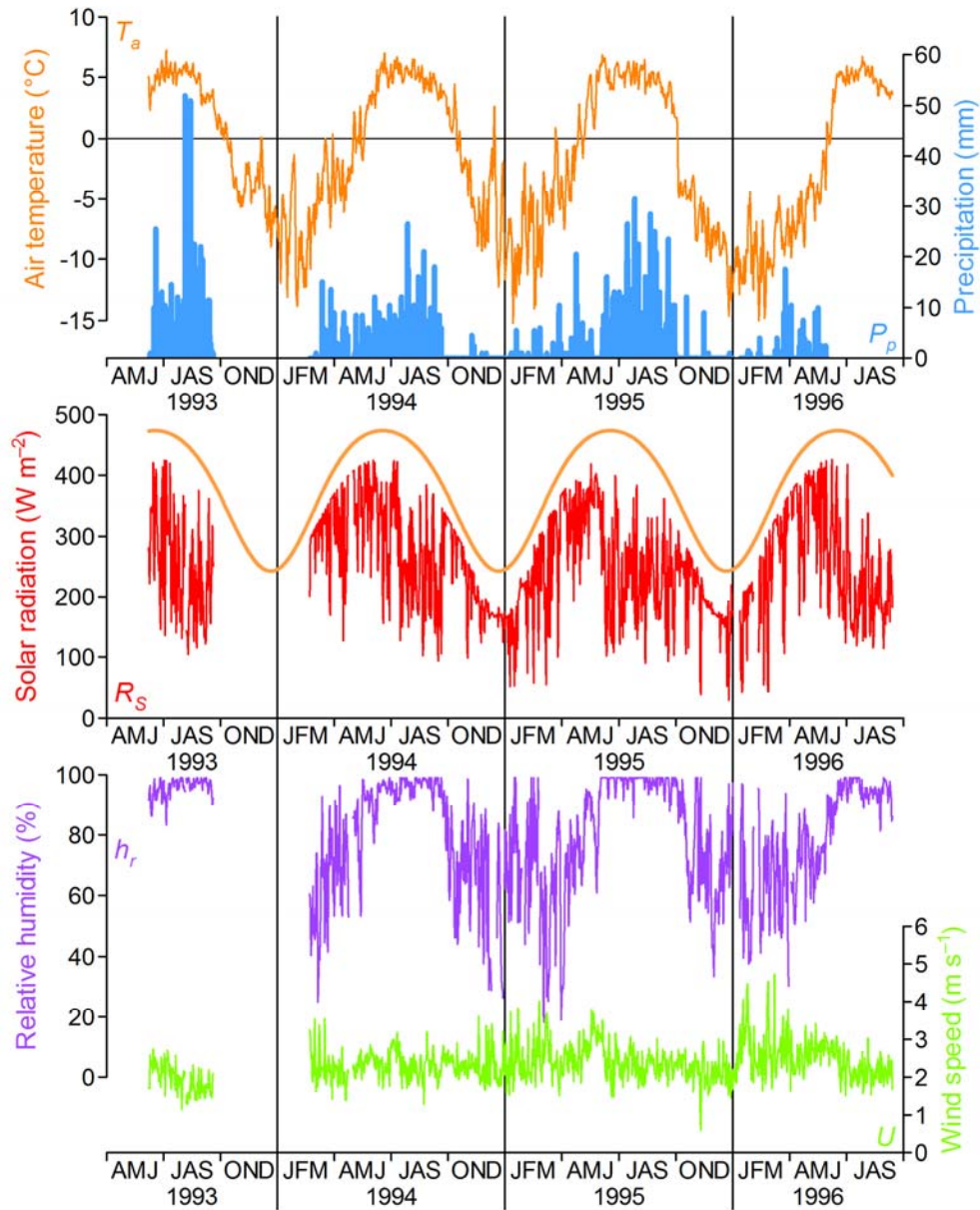


Figure S2. Meteorological variables observed at the outlet (the cross in Fig. 1a) of the Tsho Rolpa Glacial Lake–Trambau Glacier basin for the period 1993–1996.  $T_a$ ,  $P_p$ ,  $R_s$ ,  $h_r$  and  $U$  denote air temperature, precipitation, solar radiation, relative humidity and wind speed, respectively. The smoothed line in the solar radiation plot denotes radiation calculated at the top of the atmosphere.

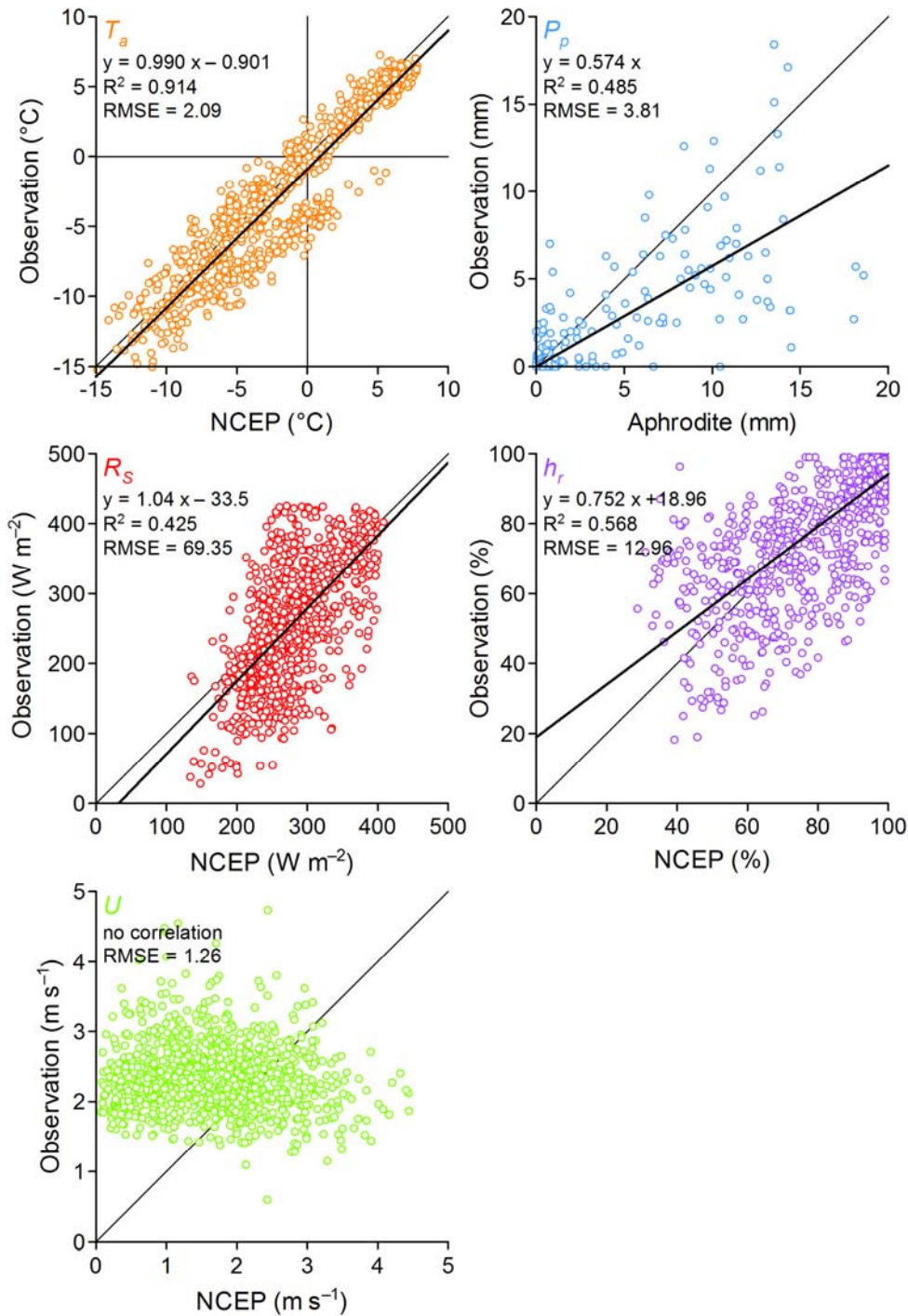


Figure S3. Comparisons between gridded and observational data at the outlet (the cross in Fig. 1a) of the Tsho Rolpa Glacial Lake–Trambau Glacier basin for the period 1993–1996.  $T_a$ ,  $P_p$ ,  $R_S$ ,  $h_r$  and  $U$  denote air temperature, precipitation, solar radiation, relative humidity and wind speed, respectively. Pentad (5-day) data are compared for precipitation while the others are daily values. Thin and thick lines denote one-to-one and linear regression lines, respectively. The intercept for precipitation is set to zero.

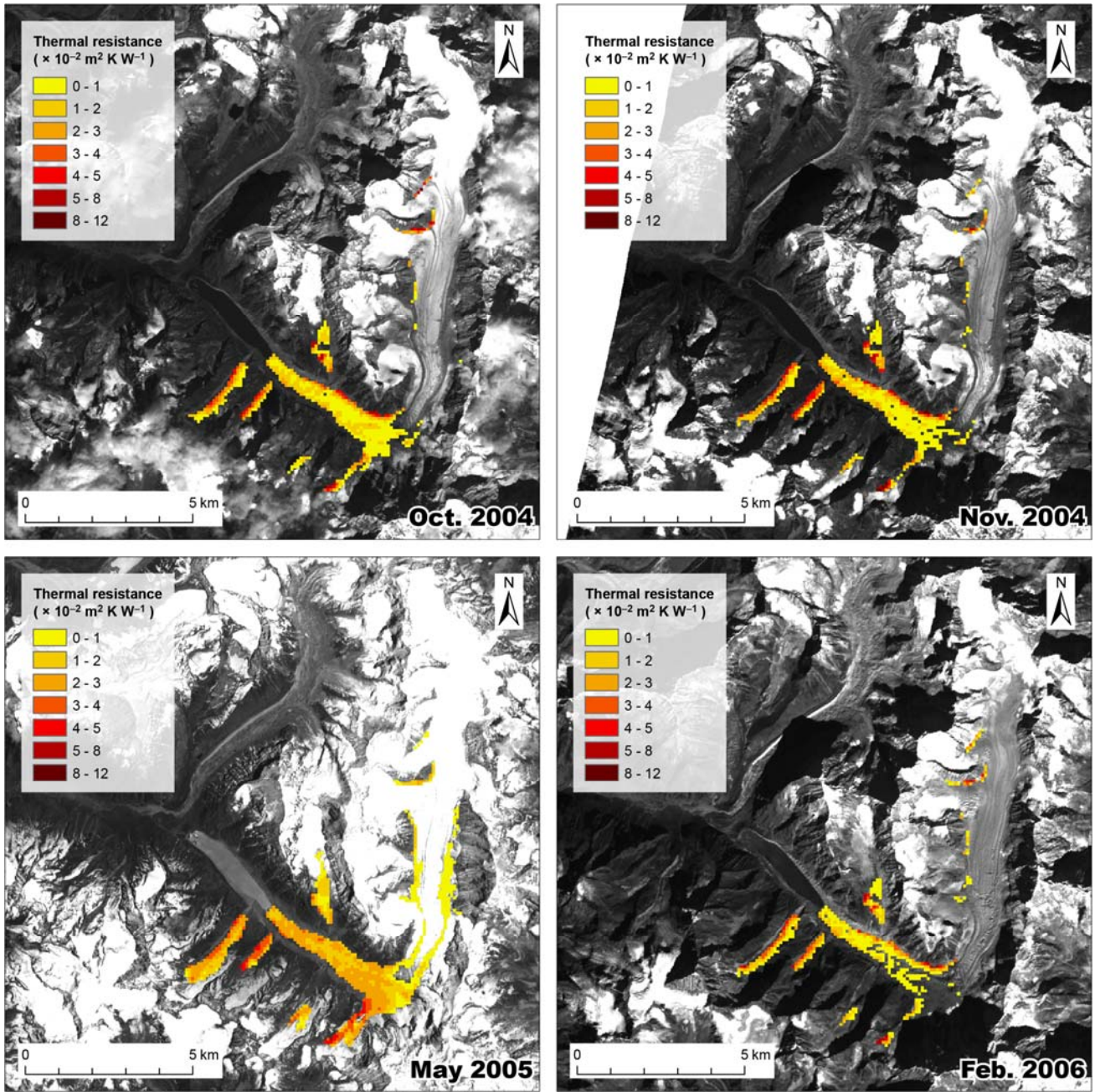


Figure S4. Distributions of thermal resistance for individual ASTER scenes on the Trambau Glacier, which we used to generate the averaged thermal resistance for the calculations.

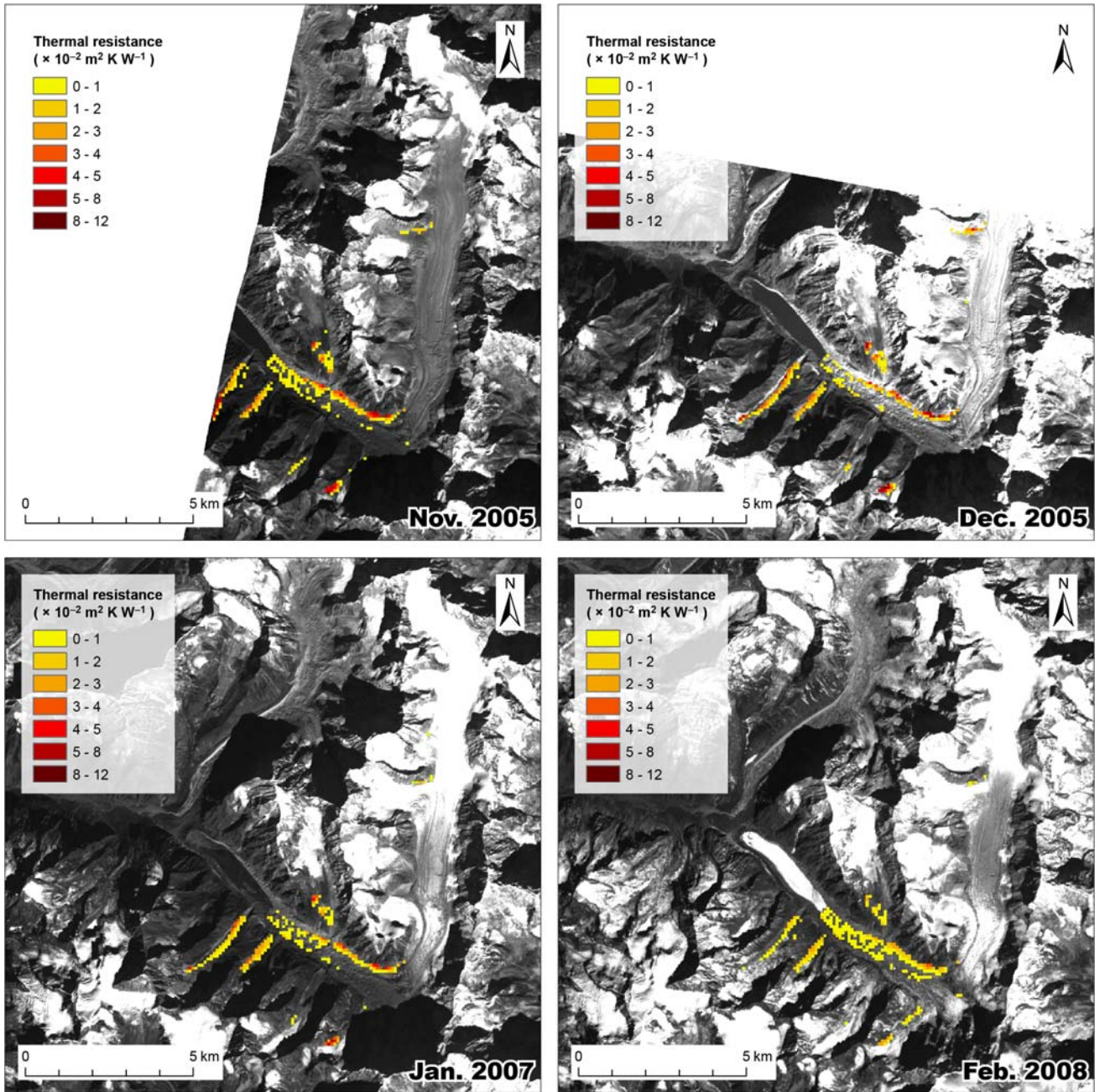


Figure S5. Distributions of thermal resistance in individual ASTER scenes on the Trambau Glacier (not used in the analysis of runoff).