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Spatial variability in mass loss of glaciers in the Everest region, central Himalayas, between 2000 and 2015

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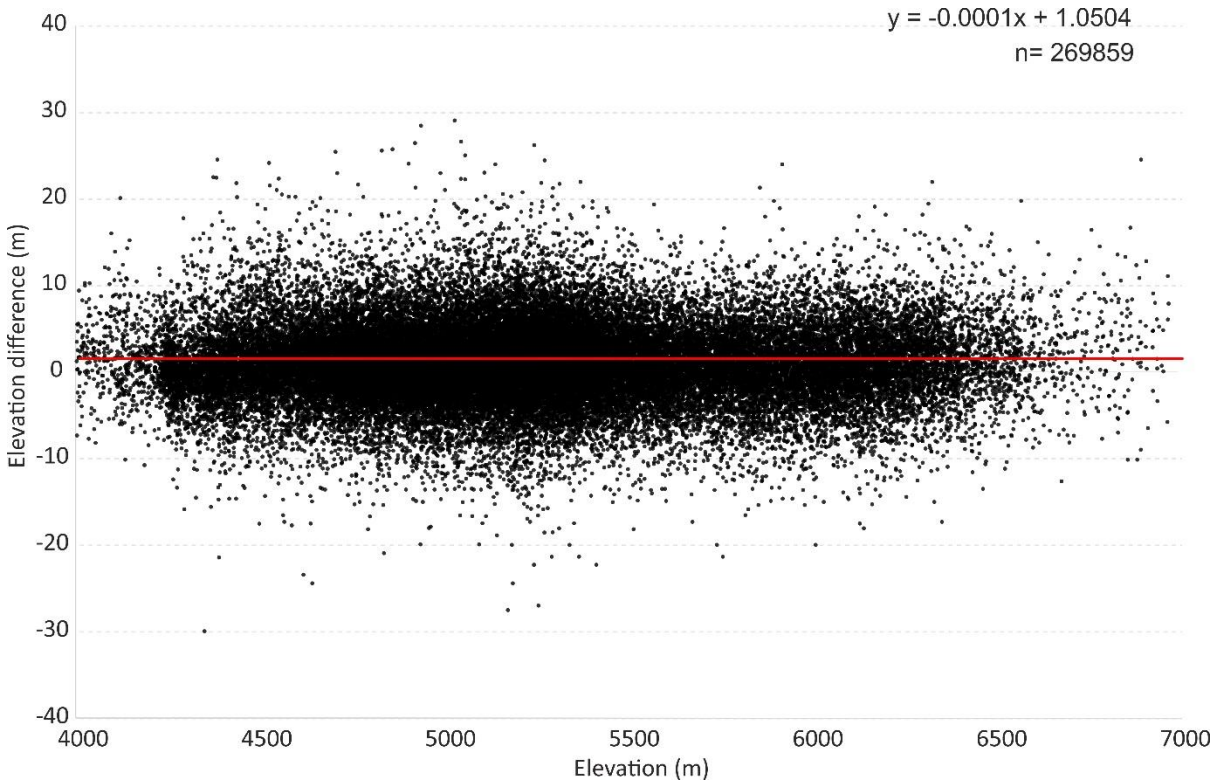

Figure S1. Elevation differences for stable ground (off-glacier) between SETSM and SRTM DEMs, plotted against elevation. There is no clear relationship between DEM differences and increasing/ decreasing elevation (often labelled an elevation dependent bias).

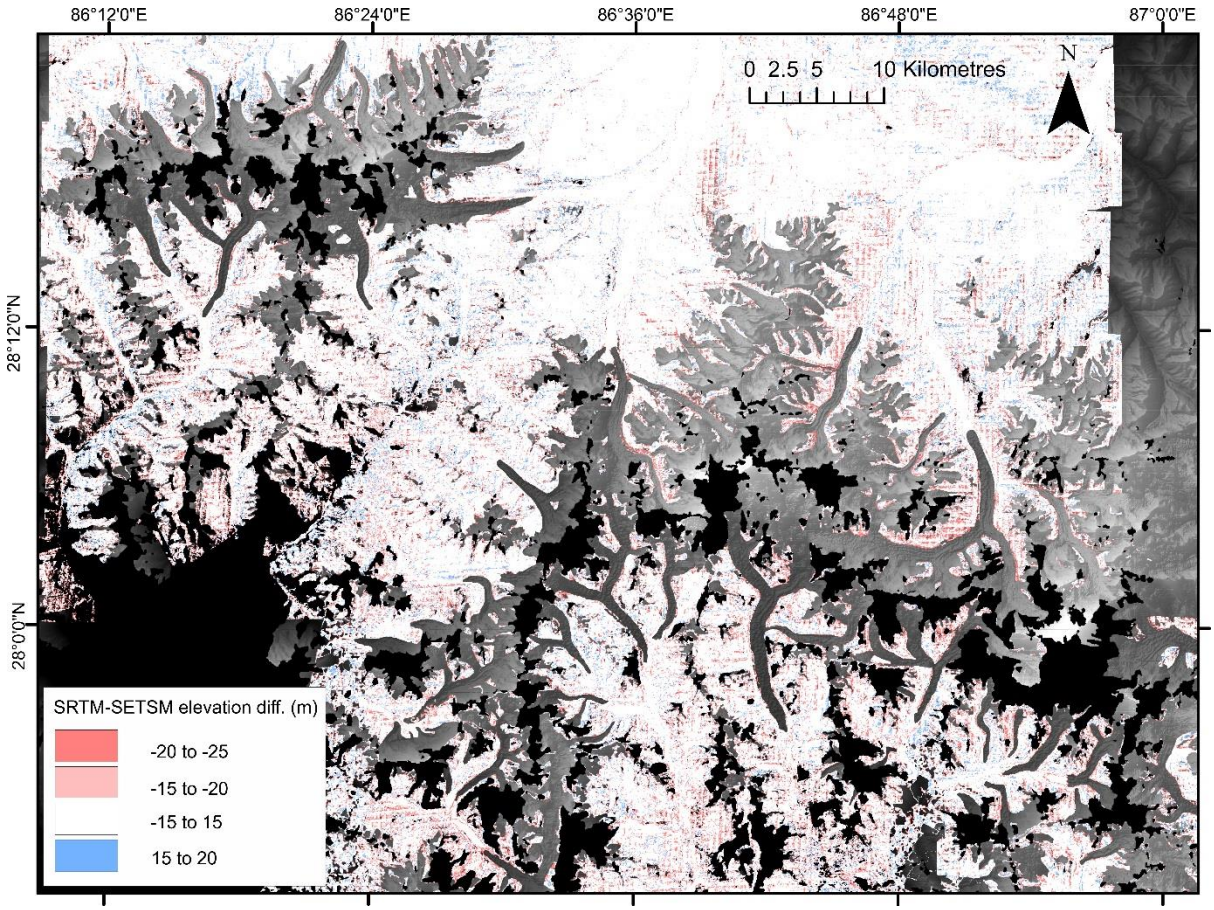

Figure S2. Elevation differences between the SRTM and SETSM DEMs over stable ground away from glacier surfaces.

Table S1. Glaciers highlighted in the study. Data on glacier area and altitudinal range are taken from the GLIMS database. Glacier length is measured along centrelines from the bergschrund. Catchment notation: TK- Tama Koshi; DK- Dudh Koshi; P- Pumqu; P clean (surface debris-free) glaciers in the Pumqu catchment.

				Altitude (m)				
GLIMS ID	Name	Length (km)	Area (km^2)	Min	Max	Range	Lake status	Catchment
G086218E28282N	Bamolelingja	7.4	15.4	5013	6745	1732	No lake	TK
G086280E28276N	G1	12.3	42.7	4778	7045	2467	No lake	TK
G086550E28133N	Yanong	3.4	4.4	4984	6377	1393	Proglacial lake	TK
G086548E28174N	Yanong North	3.2	4.1	5025	6524	1499	Proglacial lake	TK
G086384E28259N	Erbu	10.9	25.8	5020	7130	2310	No lake	TK
G086471E27959N	Drogpa Nagtsang	8.2	25.3	5018	7031	2013	Supraglacial lake	TK
G086537E27874N	Trakarding	17.7	35.4	4561	6659	2098	Proglacial lake	TK
G086519E27919N	Ripimo Shar	10.3	19.7	4600	6683	2083	No lake	TK
G086533E28088N	Shalong	7.9	18.4	5301	6835	1534	No lake	TK
G086771E28015N	Ngozumpa	22.2	80.7	4686	8176	3490	Supraglacial lake	DK
G086949E27913N	Imja	6.5	15.3	5021	7998	2977	Supraglacial lake	DK
G086820E27978N	Khumbu	15.7	39.5	4915	8062	3147	Coalescing ponds	DK
G086625E28029N	Lumbsamba	9.1	12.5	4936	7258	2322	No lake	DK
G086917E27925N	Lhotse	7.1	6.9	4821	6082	1261	No lake	DK
G086541E27988N	Melung	6.5	7.6	5271	6028	757	No lake	DK
G086587E28039N	Bhote Kosi	14.4	28.4	4793	6679	1886	No lake	DK
G086900E27843N	Hungu	4.7	13.9	5207	6942	1735	Proglacial lake	DK
G086900E27843N	Marala	2.9	13.9	5366	5920	554	Proglacial lake	DK
G086798E28111N	Jiuda	10.1	15.9	5405	7801	2396	No lake	P
G086719E28132N	Gyachung	13.6	47.1	5309	7853	2544	No lake	P
G086939E28060N	Rongbuk East	10.9	26.7	5640	8361	2721	No lake	P
G086866E28050N	Rongbuk	19.5	73.2	5153	8758	3605	Supraglacial lake	P
G086466E28321N	Ayi	8.6	7.27	5313	6863	1550	Coalescing ponds	P
G086456E28291N	Tibet 1	12.9	26.8	5138	7085	1947	Coalescing ponds	P
G086633E28122N	Gyabrag	11.5	33.2	5095	8182	3087	No lake	P
G086235E28330N	Longmojian	4.5	9.3	5348	6788	1440	Proglacial lake	P
G086382E28331N	Duiya	9.3	22.5	5480	7201	1721	Proglacial lake	P
G086395E28347N	Duosangpuxi	5.5	7.7	5561	6992	1431	No lake	P clean
G086657E28179N	Siguang	5.2	5.8	5652	6866	1214	No lake	P clean
G086423E28367N	Duosangpudong	6.3	8.8	5502	6925	1423	No lake	P clean
G086709E28242N	G08	3.8	6.4	5726	6475	749	No lake	P clean
G086275E28322N	G06	6.0	6.0	5545	6926	1381	No lake	P clean

Table S2. Mean and maximum surface lowering rates measured in glacier ablation zones, and geodetic mass balance estimates for each glacier included in the study. Bold text indicates lacustrine-terminating glaciers; means are italicised. The uncertainty of mass balance estimates contains an additional 7% error compared to the surface lowering estimates due to potential errors in the density conversion.

Glacier	Mean SL rate (m a^{-1})	Maximum SL rate (m a^{-1})	Mass balance (m w.e. a^{-1})	Catchment
Bamolelingja	–0.58 ± 0.19	–1.50 ± 0.19	–0.63 ± 0.20	TK
G1	–0.47 ± 0.19	–1.25 ± 0.19	–0.42 ± 0.20	TK
Erbu	–0.50 ± 0.13	–0.73 ± 0.13	–0.32 ± 0.14	TK
Ripimo Shar	–0.72 ± 0.24	–0.97 ± 0.24	–0.30 ± 0.25	TK
Shalong	–0.52 ± 0.10	–0.96 ± 0.10	–0.32 ± 0.11	TK
Mean	*–0.55 ± 0.17*	*–1.08 ± 0.17*	*–0.40 ± 0.18*	
Ngozumpa	–0.64 ± 0.18	–1.17 ± 0.18	–0.53 ± 0.19	DK
Khumbu	–0.84 ± 0.14	–1.34 ± 0.14	–0.35 ± 0.15	DK
Lumbsamba	–0.31 ± 0.15	–0.89 ± 0.15	–0.17 ± 0.16	DK
Lhotse	–0.66 ± 0.13	–0.99 ± 0.13	–0.65 ± 0.14	DK
Melung	–0.40 ± 0.11	–1.12 ± 0.11	–0.74 ± 0.12	DK
Bhote Kosi	–0.72 ± 0.14	–1.33 ± 0.14	–0.58 ± 0.15	DK
Mean	*–0.59 ± 0.14*	*–1.14 ± 0.14*	*–0.50 ± 0.15*	
Jiuda	–0.64 ± 0.23	–1.33 ± 0.23	–0.55 ± 0.24	P
Gyachung	–0.66 ± 0.29	–1.07 ± 0.29	–0.44 ± 0.31	P
Rongbuk East	–1.04 ± 0.18	–2.45 ± 0.18	–0.44 ± 0.19	P
Rongbuk	–1.31 ± 0.32	–2.02 ± 0.32	–0.57 ± 0.34	P
Ayi	–0.68 ± 0.24	–1.45 ± 0.24	–0.58 ± 0.26	P
Tibet 1	–1.17 ± 0.20	–2.14 ± 0.20	–0.83 ± 0.21	P
Gyabrag	–1.22 ± 0.22	–3.40 ± 0.22	–0.74 ± 0.23	P
Mean	*–0.96 ± 0.24*	*–1.98 ± 0.24*	*–0.59 ± 0.26*	
Duosangpuxi	–0.53 ± 0.20	–1.30 ± 0.20	–0.24 ± 0.26	P-clean
Siguang	–0.61 ± 0.23	–1.06 ± 0.23	–0.29 ± 0.36	P-clean
Duosangudong	–0.31 ± 0.24	–0.91 ± 0.24	–0.29 ± 0.16	P-clean
G08	–0.49 ± 0.21	–0.96 ± 0.21	–0.21 ± 0.36	P-clean
G06	–0.51 ± 0.22	–0.98 ± 0.22	–0.24 ± 0.16	P-clean
Mean	*–0.49 ± 0.22*	*–1.04 ± 0.22*	*–0.25 ± 0.24*	
Longmojian	**–1.12 ± 0.21**	**–2.53 ± 0.21**	**–0.91 ± 0.22**	**P**
Duiya	**–0.65 ± 0.12**	**–1.45 ± 0.12**	**–0.45 ± 0.13**	**P**
Hungu	**–0.54 ± 0.25**	**–1.10 ± 0.25**	**–0.56 ± 0.27**	**DK**
Marala	**–0.61 ± 0.30**	**–2.24 ± 0.30**	**–0.88 ± 0.32**	**DK**
Imja	**–0.84 ± 0.22**	**–1.62 ± 0.22**	**–0.79 ± 0.24**	**DK**
Drogpa Nagtsang	**–0.78 ± 0.33**	**–1.91 ± 0.33**	**–0.75 ± 0.35**	**TK**
Trakarding	**–0.94 ± 0.39**	**–2.19 ± 0.39**	**–0.48 ± 0.41**	**TK**
Yanong	**–1.55 ± 0.17**	**–3.78 ± 0.17**	**–0.76 ± 0.18**	**TK**
Yanong North	**–1.13 ± 0.24**	**–3.06 ± 0.24**	**–0.62 ± 0.25**	**TK**
Mean	***–0.90 ± 0.25***	***–2.20 ± 0.25***	***–0.70 ± 0.27***	

Table S3. Hypsometric Index (HI) scores and classification, accumulation area ratio (AAR) and total area loss for each glacier included in the study. EQ = Equidimensional; BH = Bottom Heavy; VBH = Very Bottom Heavy; TH = Top Heavy. The ELA of the Lhotse and Melung glaciers are now above their altitudinal ranges, thus AARs cannot be calculated. Catchments: TK- Tama Koshi; DK- Dudh Koshi; TP- Tibetan Plateau. Lacustrine terminating glaciers are in bold; mean values are italicised.

Glacier	HI score	HI classification	AAR	Area change (km^2) & % of total area.	Approximate ELA (m)	Catchment
Bamolelingja	0.91	EQ	0.37	–0.07 ± 0.08 (0.44%)	5593	TK
G1	1.45	BH	0.46	–0.49 ± 0.22 (1.15%)	5659	TK
Yanong	**0.94**	**EQ**	**0.50**	**–0.31** ± 0.02 **(6.33%)**	**5557**	TK
Yanong North	**1.22**	**EQ**	**0.43**	**–0.16** ± 0.02 **(4.07%)**	**5622**	TK
Erbu	1.15	EQ	0.45	–0.05 ± 0.13 (0.24%)	5654	TK
Drogpa	**1.18**	**EQ**	**0.38**	**–2.37** ± 0.13 **(9.12%)**	**5623**	TK
Nagtsang Trakarding	**0.69**	**EQ**	**0.33**	**–0.35** ± 0.18 **(0.98%)**	**5708**	TK
Ripimo Shar	0.98	EQ	0.57	–0.04 ± 0.10 (0.20%)	5408	TK
Shalong	1.21	BH	0.41	–0.09 ± 0.09 (0.45%)	5288	TK
Mean	*1.14*	*EQ*	*0.43*	*–0.43 ± 0.11 (2.55%)*	*5568*	
Ngozumpa	2.62	VBH	0.39	–0.13 ± 0.16 (0.16%)	5815	DK
Imja	**5.93**	VBH	**0.50**	**–0.5** ± 0.06 **(3.21%)**	**5366**	DK
Khumbu	3.95	VBH	0.51	–0.06 ± 0.18 (0.22%)	5568	DK
Lumbsamba	3.11	VBH	0.40	–0.02 ± 0.05 (0.15%)	5527	DK
Lhotse	1.93	VBH	0.27	0 ± 0.03 (0%)	5149	DK
Melung	1.52	VBH	0.50	–0.20 ± 0.03 (2.55%)	5270	DK
Bhote Kosi	2.36	VBH	0.38	–0.13 ± 0.12 (0.51%)	5310	DK
Hungu	**1.69**	**VBH**	**0.54**	**–0.13** ± **0.06 (1.53%)**	**5687**	DK
Marala	**0.56**	**EQ**	**0.20**	**–0.11** ± 0.06 **(2.2%)**	**5607**	DK
Mean	*2.63*	*VBH*	*0.41*	*–0.14 ± 0.11 (1.17%)*	*5477*	
Jiuda	1.45	BH	0.35	–0.10 ± 0.06 (0.62%)	6223	P
Gyachung	1.85	VBH	0.36	–0.06 ± 0.17 (0.21%)	6290	P
Rongbuk East	2.58	VBH	0.44	–0.80 ± 0.10 (2.85%)	6419	P
Rongbuk	3.25	VBH	0.48	–0.14 ± 0.27 (0.16%)	5923	P
Ayi	3.00	VBH	0.30	–0.31 ± 0.03 (3.90%)	5722	P
Tibet 1	2.80	VBH	0.54	–0.35 ± 0.10 (1.38%)	5653	P
Gyabrag	2.83	VBH	0.33	–1.17 ± 0.12 (3.32%)	6059	P
Longmojian	**3.09**	**VBH**	**0.41**	**–0.44** ± 0.03 **(4.28%)**	**5795**	P
Duiya	**1.39**	**BH**	**0.17**	**–0.50** ± 0.08 **(2.07%)**	**6256**	P
Mean	*2.47*	*VBH*	*0.37*	*–0.39* ± 0.11 *(1.91%)*	*6037*	
Duosangpuxi	1.23	BH	0.40	–0.16 ± 0.22 (2.07%)	6276	P clean
Siguang	1.03	EQ	0.50	–0.06 ± 0.16 (1.03%)	6259	P clean
Duosangpudong	1.19	EQ	0.42	–0.10 ± 0.15 (1.13%)	6213	P clean
G08	0.76	EQ	0.68	–0.07 ± 0.18 (1.09%)	6100	P clean
G06	1.73	VBH	0.36	–0.08 ± 0.07 (1.25%)	6235	P clean
Mean	*1.18*	*EQ*	*0.47*	*–0.09* ± 0.15 *(1.31%)*	*6216*	