

Supplement to

Towards ice thickness inversion: an evaluation of global DEMs by ICESat-2 in the glacierized Tibetan Plateau

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Table S1. Statistics of elevation difference (m) between six DEMs and ICESat-2 over four glacierized sub-zones (defined in Fig. 7e).

Item	Zone	AW3D30	SRTM-GL1	NASADEM	TanDEM-X	SRTM v4.1	MERIT
Mean difference	1	-38.6	-41.5	-9.7	-4.2	-39.9	-40.9
	2	-33.0	-32.8	-2.4	-0.7	-31.9	-33.1
	3	-29.3	-27.0	3.4	1.6	-27.4	-28.5
	4	-28.4	-25.5	7.0	4.7	-25.9	-26.6
Absolute Mean difference	1	38.7	41.8	14.5	10.5	41.0	41.5
	2	33.1	33.0	8.9	8.0	32.4	33.3
	3	29.4	27.2	7.8	9.0	28.1	28.9
	4	28.7	26.0	9.5	12.5	28.3	28.0
Standard Deviation	1	15.1	19.6	16.5	15.7	23.2	21.5
	2	13.0	15.1	11.6	13.2	17.3	16.1
	3	12.0	13.1	9.2	15.8	17.1	15.5
	4	12.6	14.1	9.6	20.7	22.0	18.8
RMSE	1	41.4	45.9	19.2	16.2	46.2	46.3
	2	35.5	36.2	11.9	13.2	36.3	36.8
	3	31.6	30.0	9.8	15.8	32.3	32.4
	4	31.1	29.1	11.9	21.3	34.0	32.6

Table S2. Weights of different models required to achieve minimum mean absolute error in ten experiments.

		AW3D30						SRTMGL1					
Exp. NO.	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	
1	0	0.37	0.46	0.17	42.18	0.67	0	0.78	0.01	0.21	39.69	0.70	
2	0	0.41	0.48	0.11	38.71	0.75	0	0.64	0.14	0.22	38.20	0.72	
3	0	0.41	0.5	0.09	41.19	0.69	0	0.86	0.01	0.13	36.40	0.75	
4	0	0.26	0.47	0.27	40.61	0.69	0	0.75	0.01	0.24	39.58	0.71	
5	0	0.73	0.17	0.1	40.20	0.67	0	0.85	0.01	0.14	38.16	0.74	
6	0	0.21	0.39	0.4	41.18	0.67	0	0.85	0.01	0.14	36.25	0.77	
7	0	0.39	0.47	0.14	41.54	0.69	0	0.74	0.01	0.25	37.27	0.75	
8	0	0.11	0.4	0.49	41.08	0.63	0	0.75	0.01	0.24	35.28	0.78	
9	0	0.58	0.29	0.13	41.43	0.69	0	0.71	0.09	0.2	37.36	0.73	
10	0	0.21	0.39	0.4	39.52	0.67	0	0.67	0.13	0.2	37.43	0.74	
Weight	0	0.37	0.40	0.23	40.76386	-	0	0.76	0.04	0.20	37.56	-	
		NASADEM						TanDEM					
Exp. NO.	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	
1	0	0.36	0.45	0.19	41.54	0.66	0.01	0	0.16	0.83	42.66	0.59	
2	0	0.48	0.49	0.03	39.03	0.71	0.01	0	0.16	0.83	40.25	0.58	
3	0	0.36	0.41	0.23	40.82	0.68	0	0.01	0.2	0.79	41.50	0.57	
4	0	0.39	0.42	0.19	41.88	0.68	0	0.01	0.17	0.82	42.39	0.59	
5	0	0.46	0.32	0.22	43.62	0.66	0.01	0	0.16	0.83	45.44	0.53	
6	0	0.53	0.22	0.25	41.97	0.66	0	0.01	0.15	0.84	41.75	0.57	
7	0	0.5	0.46	0.04	43.83	0.66	0.01	0	0.16	0.83	41.28	0.60	
8	0	0.52	0.47	0.01	42.35	0.70	0	0.01	0.17	0.82	42.07	0.58	
9	0	0.38	0.43	0.19	39.29	0.69	0	0.01	0.18	0.81	43.31	0.53	
10	0	0.45	0.44	0.11	41.72	0.67	0	0.01	0.18	0.81	41.07	0.58	
Weight	0.00	0.44	0.41	0.15	41.60	-	0.00	0.01	0.17	0.82	42.17	-	
		SRTM v4.1						MERIT					
Exp. NO.	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	GlabTop2	HF	ITBOV	OGGM	MAE	R ²	
1	0	0.47	0.2	0.33	50.86	0.55	0	0.31	0.15	0.54	50.76	0.52	
2	0	0.48	0.19	0.33	47.26	0.59	0	0.01	0.38	0.61	52.65	0.50	
3	0	0.03	0.1	0.87	48.88	0.48	0	0.34	0.19	0.47	53.64	0.48	
4	0	0.7	0.27	0.03	49.03	0.60	0	0.4	0.15	0.45	52.39	0.50	
5	0	0.06	0.09	0.85	49.30	0.52	0	0.34	0.19	0.47	53.67	0.47	
6	0	0.34	0.14	0.52	48.25	0.50	0	0.4	0.15	0.45	51.37	0.48	
7	0	0.01	0.26	0.73	49.54	0.48	0	0.23	0.32	0.45	52.38	0.50	
8	0	0.09	0.38	0.53	50.80	0.52	0	0.01	0.2	0.79	53.58	0.43	
9	0	0.08	0.13	0.79	47.17	0.54	0	0.25	0.36	0.39	51.60	0.50	
10	0	0.43	0.24	0.33	47.72	0.58	0	0.08	0.13	0.79	49.66	0.50	
Weight	0.00	0.27	0.20	0.53	48.88	-	0.00	0.24	0.22	0.54	52.17	-	

Table S3. Statistics of the elevation difference (m) between six DEMs and ICESat-2 before and after shifting to correct for the two misregistration issues shown in Fig.14.

	DEM	shift_pix	r ²	ME		MAE		STD		RMSE	
				Before	After	Before	After	Before	After	Before	After
Fig.14a	AW3D30	6.76	0.90	-50.62	-49.57	50.62	49.57	1.72	4.87	50.65	49.80
	SRTM-GL1	3.95	0.84	-50.88	-50.31	50.88	50.31	2.66	3.69	50.94	50.44
	NASADEM	0.07	0.68	0.09	0.08	1.65	1.65	2.15	2.15	2.15	2.15
	TanDEM-X	0.02	0.82	-0.04	-0.05	1.23	1.23	1.70	1.70	1.70	1.70
	SRTM v4.1	2.53	0.80	-50.86	-49.73	50.86	49.73	2.73	5.89	50.94	50.08
	MERIT	2.46	0.99	-50.43	-49.29	50.43	49.29	2.62	5.79	50.50	49.63
Fig. 14b	AW3D30	0.47	0.90	-37.67	-37.36	37.67	37.37	11.80	12.35	39.48	39.35
	SRTM-GL1	0.30	0.84	-40.61	-40.25	40.62	40.27	15.02	15.05	43.30	42.97
	NASADEM	0.04	0.68	-10.08	-10.10	12.75	12.74	14.03	14.01	17.28	17.27
	TanDEM-X	0.00	0.82	-4.07	-4.07	8.26	8.26	10.00	10.00	10.80	10.79
	SRTM v4.1	0.12	0.80	-40.86	-40.62	40.92	40.70	17.18	17.51	44.33	44.23
	MERIT	0.35	0.99	-40.34	-40.09	40.40	40.17	17.15	17.46	43.84	43.73

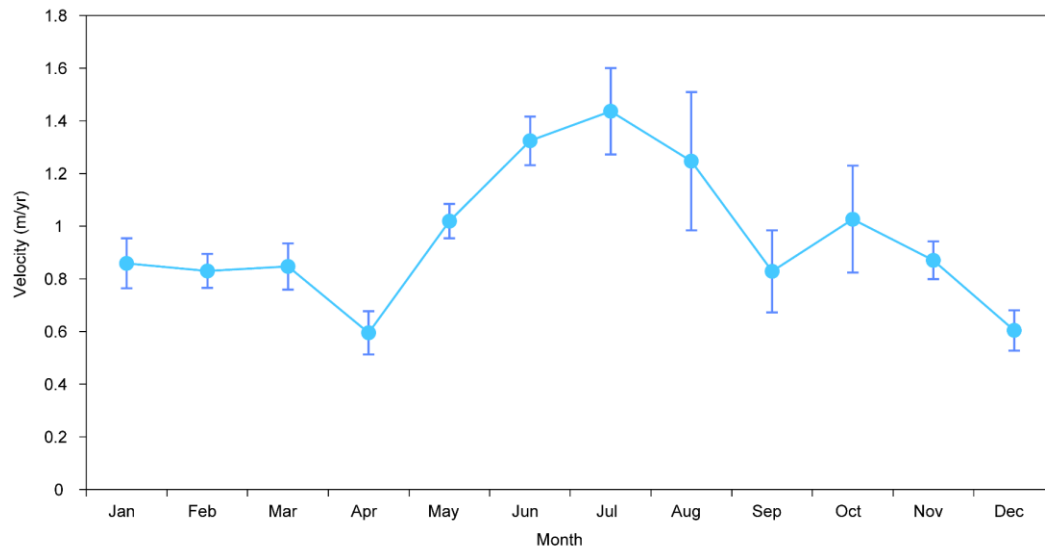


Fig.S1. Mean monthly ice velocity from Global Land Ice Velocity Extraction by Landsat 8 (GoLIVE) in path 147 and row 038 where Chhotashigri is located.