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Mass changes of Southern and Northern Inylchek Glacier, Central Tian Shan, Kyrgyzstan, during ∼1975 and 2007 derived from remote sensing data

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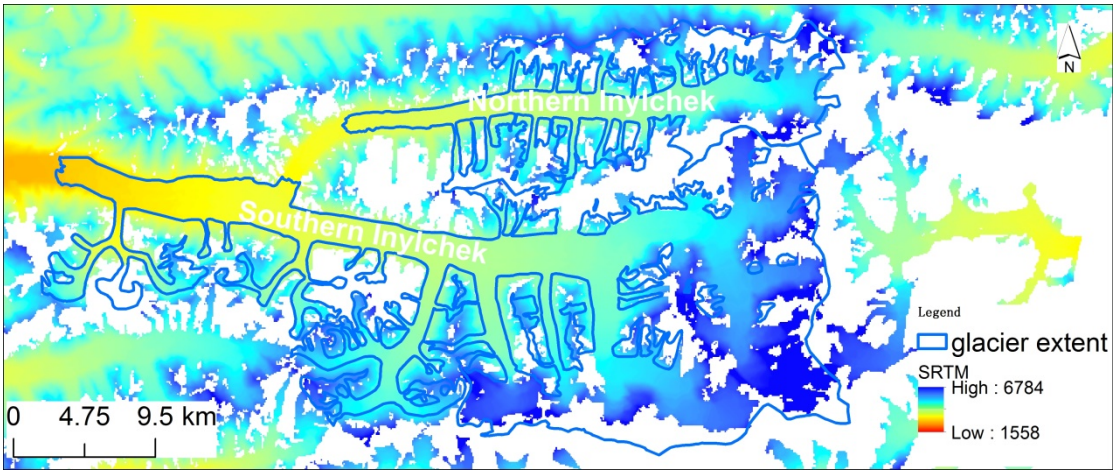
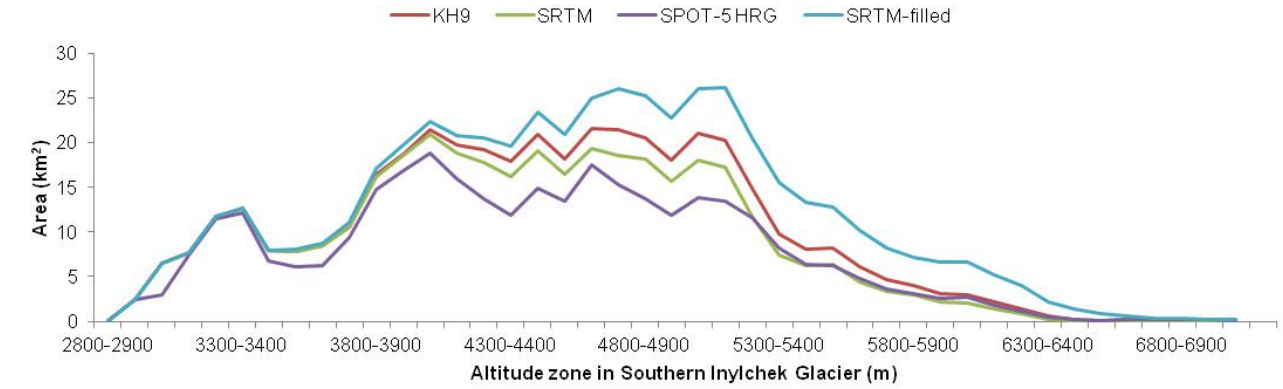
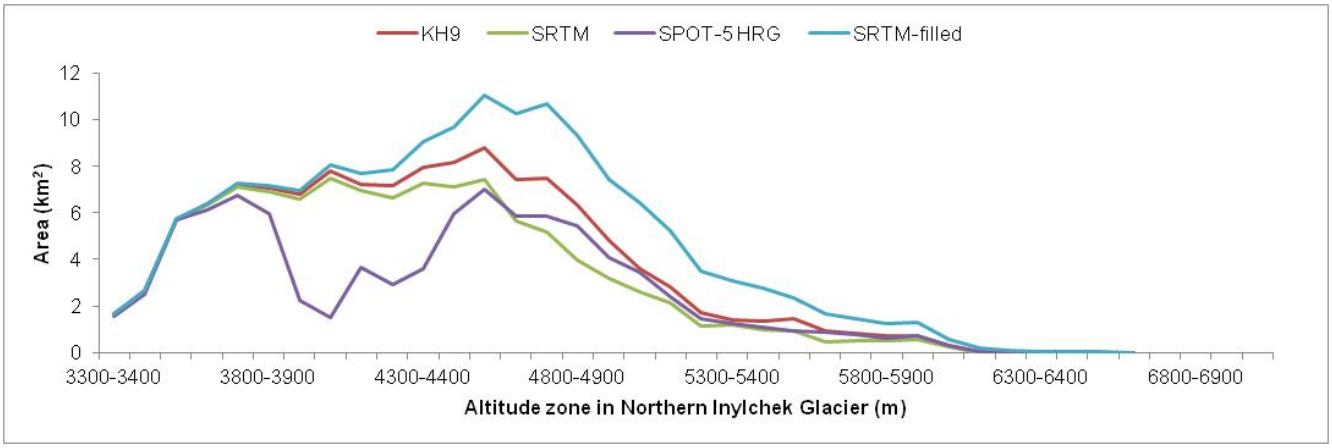
Supplementary Figures

Supplementary Figure S1. The extent of SRTM. The White part is a lack of SRTM.

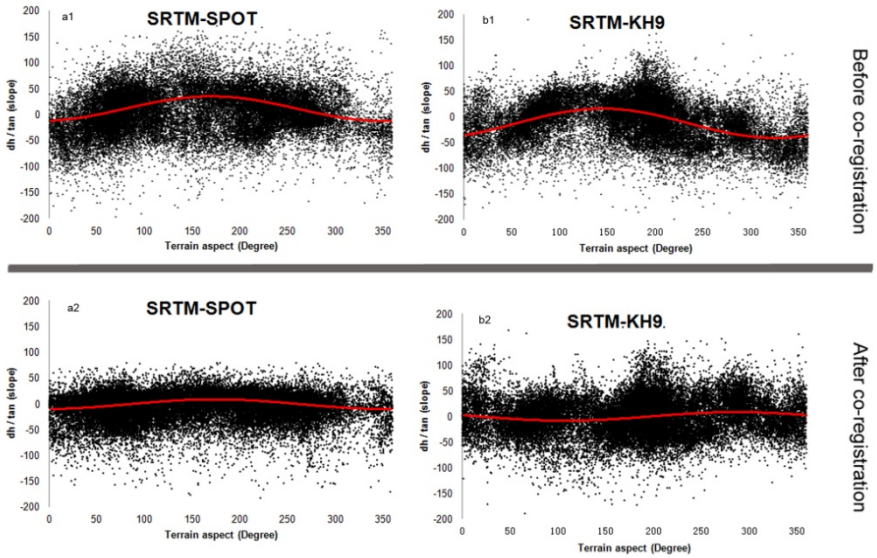


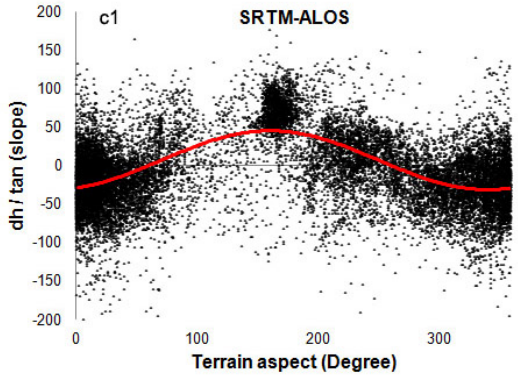
Supplementary Figure S2. The distribution of area in each zone for KH9, SRTM, SPOT-5 HRG and SRTM-filled version. The area of SRTM-filled version represented all samples of Southern Inylchek Glacier and Northern Inylchek Glacier.

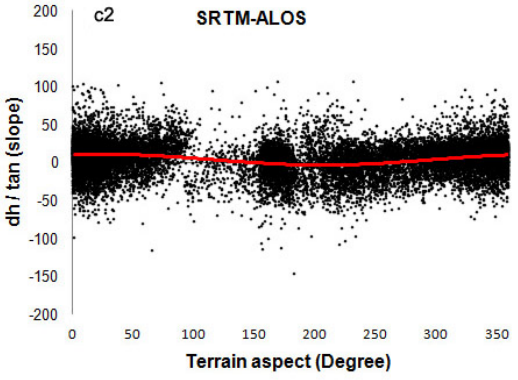




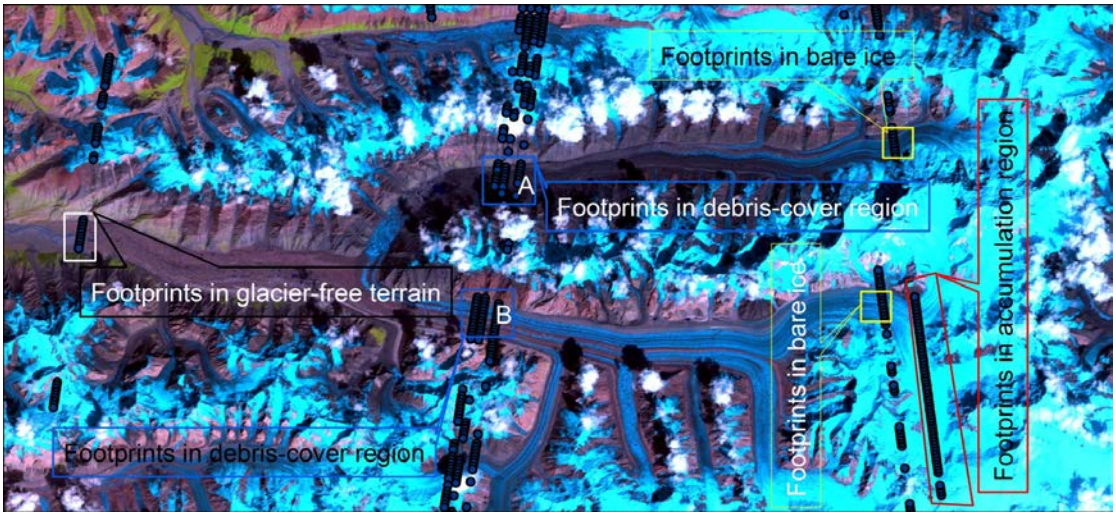
Supplementary Figure S3. Scatter plot of slope standardized elevation differences of terrain aspect. Scatter plot of slope standardized elevation differences of Terrain aspect. a1: SRTM vs. SPOT5 before co-registration; a2: SRTM vs. SPOT5 after co-registration; b1: SRTM vs. KH9 before co-registration; b2: SRTM vs. KH9 after co-registration; c1: SRTM vs. ALOS before co-registration; c2: SRTM vs. ALOS after co-registration.



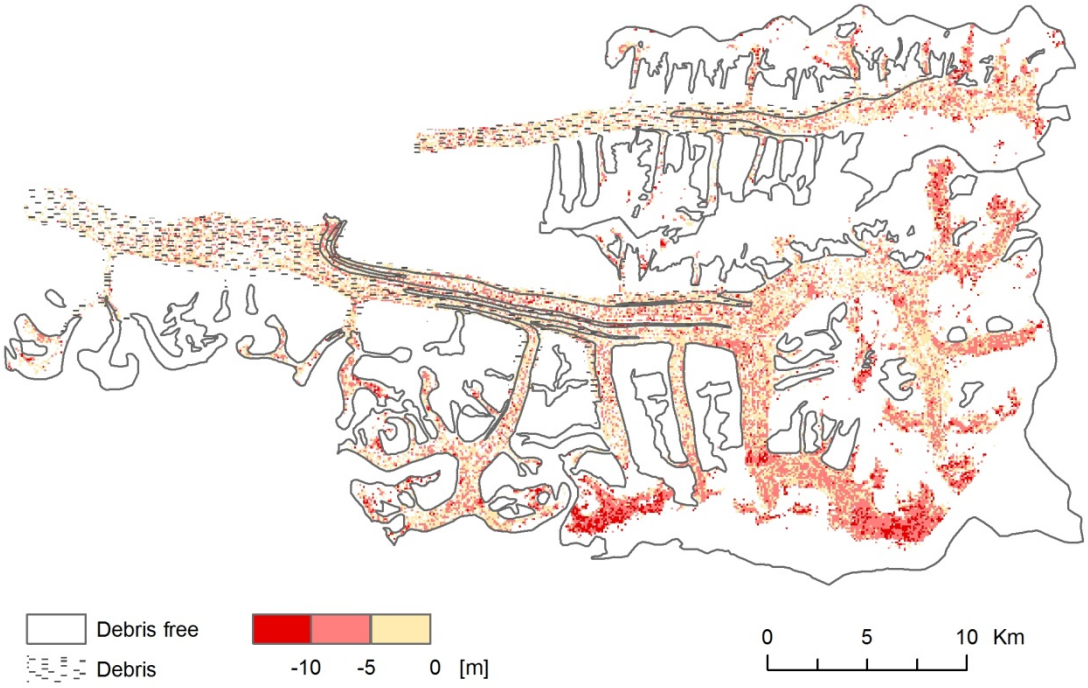




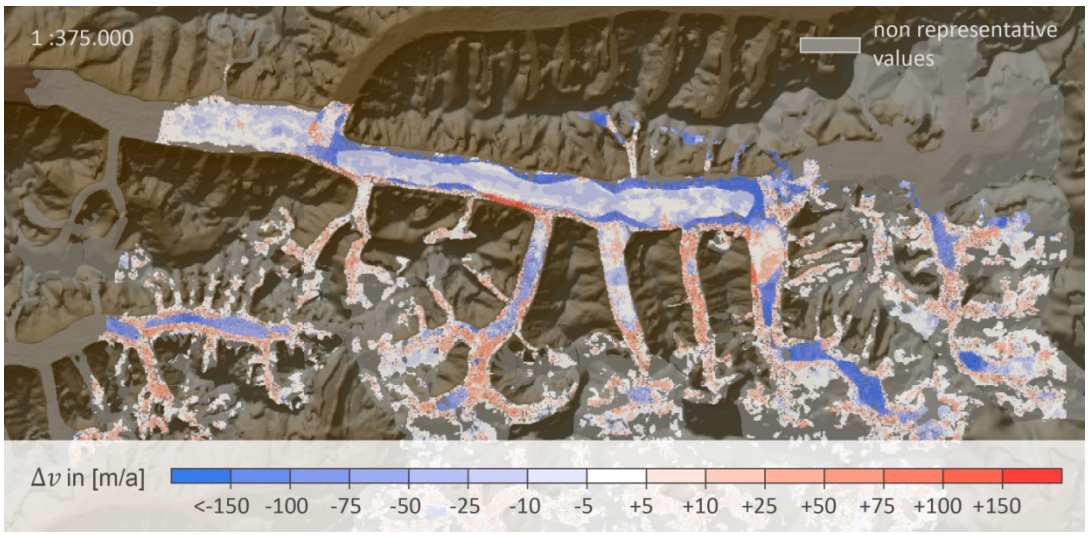
Supplementary Figure S4. ICESat GLA 14 footprints in/close to Southern and Northern Inylchek Glacier. Region A was in debris-cover ice; region B was parts in debris-cover ice and parts covered by bare ice.



Supplementary Figure S**5**. Penetration depth of SRTM C band along with elevation.



Supplementary Figure S6. Velocity difference between Southern Inylchek Glacier in 2002/2003 and in 2010/2011



Tables:

Supplementary Table S1. RMSE for GCPs of ALOS and SPOT5 data

	ALOS	SPOT5
No.GCPs	4	4
RMSEx	0.99m	1.4m
RMSEy	2.15m	1.3m
RMSEz	1.5m	2.5m

Supplementary Table S2. Shift vectors in x, y and z direction (Master DEM->slave DEM) and DEM uncertainty

	Shift vectors in x, y and z direction			**Before co-registration outside glaciers**		**After co-registation**		**Normalized median absolute deviation(m)**	**Uncertainty(m)**
	X(m)	Y(m)	Z(m)	Mean elevation difference(m)	Standard deviation (STD)(m)	Mean elevation difference(m)	Standard deviation(m)		
SRTM->SPOT	18.7	-46.5	1.3	6.8	20.8	0.4	13.0	1.0	2.5
SRTM->KH-9	34.3	27.3	-5.3	-2.0	18.1	-1.0	15.3	0.5	2.4
SPOT->KH-9	-3.8	22.4	-6.3	-7.7	15.9	-1.4	15.9	1.1	2.5
SRTM->ALOS	23.5	-51.2	6	-6.5	22.3	2.5	10.1	2.1	3.1
ALOS->KH-9	6.2	22.8	-19.5	-12.8	20.5	2.7	19.0	2.3	3.3

Supplementary Table S3**.** Annual elevation change for SIG and NIG in each altitude zone

Altitude zones	SIG (m a^{-1})			NIG(m a^{-1})		
	1999-2007	1975-1999	1975-2007	1999-2007	1975-1999	1975-2007
2800-2900		-0.51	-0.41			
2900-3000	-2.18	-0.38	-0.69			
3000-3100	-1.49	-0.28	-0.56			
3100-3200	-1.40	-0.35	-0.57			
3200-3300	-1.51	-0.27	-0.58			
3300-3400	-1.42	-0.19	-0.56	-1.60	2.99	2.00
3400-3500	-1.22	-0.21	-0.41	-1.90	4.81	3.05
3500-3600	-1.02	-0.26	-0.51	-2.61	2.95	1.60
3600-3700	-0.94	-0.28	-0.48	-2.14	-0.54	-1.03
3700-3800	-0.74	-0.40	-0.55	-1.13	-1.66	-1.50
3800-3900	-0.68	-0.49	-0.61	-0.15	-1.91	-1.54
3900-4000	-0.61	-0.52	-0.61	-0.10	-1.51	-0.97
4000-4100	-0.56	-0.60	-0.63	-0.26	-1.41	-0.93
4100-4200	-0.42	-0.61	-0.64	-0.23	-1.31	-1.00
4200-4300	-0.30	-0.63	-0.61	-0.08	-1.08	-0.78
4300-4400	-0.15	-0.62	-0.59	-0.11	-0.76	-0.47
4400-4500	-0.09	-0.67	-0.55	-0.13	-0.39	-0.35
4500-4600	0.19	-0.62	-0.50	-0.14	-0.25	-0.27
4600-4700	0.31	-0.50	-0.41	-0.61	-0.05	-0.13
4700-4800	0.17	-0.47	-0.40	-0.62	0.04	-0.16
4800-4900	0.13	-0.53	-0.40	-1.01	0.08	-0.13
4900-5000	-0.10	-0.51	-0.39	-1.22	0.06	-0.19
5000-5100	-0.13	-0.51	-0.37	-1.16	0.01	-0.23
5100-5200	0.00	-0.53	-0.33	-0.90	-0.12	-0.26
5200-5300	-0.25	-0.51	-0.40	-0.88	0.05	-0.24
5300-5400	-0.24	-0.51	-0.38	-0.75	0.05	-0.22
5400-5500	-0.26	-0.46	-0.38	-0.70	0.08	-0.21
5500-5600	-0.15	-0.46	-0.33	-1.13	0.10	-0.31
5600-5700	-0.07	-0.50	-0.49	-1.09	-0.19	-0.40
5700-5800	-0.79	-0.53	-0.59	0.05	-0.16	-0.31
5800-5900	-0.55	-0.40	-0.37	0.13	-0.15	-0.41
5900-6000	0.02	-0.41	-0.25	-0.51	-0.20	-0.32
6000-6100	-0.13	-0.40	-0.24	0.08	-0.32	-0.34
6100-6200	-0.03	-0.18	-0.18	0.05	-0.27	-0.36
6200-6300	-0.42	-0.02	-0.09	-0.08	-0.30	-0.35
6300-6400	-0.51	0.08	-0.06	0.05		-0.32
6400-6500	-0.55	0.21	-0.03			
6500-6600	-0.33	-0.05	-0.06			

6600-6700	-0.20	-0.02	-0.03