Table S1. Information of the attribute table for the glacier inventory. Abbreviations correspond to those in "Glacier" tab in "supplement_data.xlsx".

Abbreviation	Note	Unit
lat	Latitude	º
long	Longitude	º
prism_id	Scene ID of assigned PRISM image	-
prism_date	Acquisition date of assigned PRISM image	-
av2_id	Scene ID of assigned AVNIR2 image	-
av2_date	Acquisition date of assigned AVNIR2 image	-
area_hor	Glacier area as horizontal surface	m^2
area_inc	Glacier area as inclined surface	m^2
peri	Glacier perimeter	m
si	Shape index (peri/area_hor)	m^{-1}
elv_max	Maximum elevation	m a.s.l.
elv_min	Minimum elevation	m a.s.l.
elv_med	Median elevation	m a.s.l.
elv_mean	Mean elevation	m a.s.l.
elv_std	Standard deviation of glacier elevation	m
c_asp	Glacier flow aspect from upper half centroid to lower half centroid	º
asp	Mean aspect of GDEM pixels on glacier	º
slp_max	Maximum slope gradient of glacier	º
slp_min	Minimum slope gradient of glacier	º
slp_mean	Mean slope gradient of glacier	º
slp_std	Standard deviation of glacier slope gradient	º
p_area_hor	PMS slope area as horizontal surface	m^2
p_area_inc	PMS slope area as inclined surface	m^2
pr_hor	PMS slope ratio as horizontal surface	-
pr_inc	PMS slope ratio as inclined surface	-
p_elv_max	Maximum elevation of PMS slope	m a.s.l.
p_elv_min	Minimum elevation of PMS slope	m a.s.l.
p_elv_med	Median elevation of PMS slope	m a.s.l.
p_elv_mean	Mean elevation of PMS slope	m a.s.l.
p_elv_std	Standard deviation of PMS slope elevation	m
p_c_asp	PMS slope flow aspect from upper half centroid to lower half centroid	º
p_asp	Mean aspect of GDEM pixels on PMS slope	º
p_slp_max	Maximum slope gradient of PMS slope	º
p_slp_min	Minimum slope gradient of PMS slope	º
p_slp_mean	Mean slope gradient of PMS slope	º
p_slp_std	Standard diviation of PMS slope gradient	º

Cont.

Abbreviation	Note	Unit
d_area_hor	Debris-covered area as horizontal surface	m^2
d_area_inc	Debris-covered area as inclined surface	m^2
dr_hor	Debris-covered ratio as horizontal surface	-
dr_inc	Debris-covered ratio as inclined surface	-
d_peri	Debris-covered perimeter	m
d_si	Shape index of debris-covered area(d_peri/d_area_hor)	m^{-1}
d_elv_max	Maximum elevation of debris-covered area	m a.s.l.
d_elv_min	Minimum elevation of debris-covered area	m a.s.l.
d_elv_med	Median elevation of debris-covered area	m a.s.l.
d_elv_mean	Mean elevation of debris-covered area	m a.s.l.
d_elv_std	Standard deviation of debris-covered area elevation	m
d_c_asp	Debris-covered area flow aspect from upper half centroid to lower half centroid	º
d_asp	Mean aspect of GDEM pixels on debris-covered area	º
d_slp_max	Maximum slope gradient of debris-covered area	º
d_slp_min	Minimum slope gradient of debris-covered area	º
d_slp_mean	Mean slope gradient of debris-covered area	º
d_slp_std	Standard deviation of debris-covered area slope gradient	º

Table S2. Information of the attribute table for TRMM 3B43 data. Contained glaciers are also analyzed. Abbreviations correspond to those in "TRMM" tab in "supplement_data.xls".

Abbreviation	Note	Unit
lat	Central latitude	º
long	Central longitude	º
prec_mean	Mean annual precipitation	mm
prec_std	Standard deviation of annual precipitation	mm
elv_max	Maximum surface elevation in the TRMM grid cell	m a.s.l.
elv_min	Minimum surface elevation in the TRMM grid cell	m a.s.l.
elv_med	Median surface elevation in the TRMM grid cell	m a.s.l.
elv_mean	Mean surface elevation in the TRMM grid cell	m a.s.l.
elv_std	Standard deviation of surface elevation in the TRMM grid cell	m
g_num	Number of glacier	-
g_area_total	Total glacier area	m^2
g_area_mean	Mean glacier area	m^2
g_area_std	Standard deviation of glacier area	m^2
g_all_elv_max	Maximum elevation of all glaciers	m a.s.l.
g_all_elv_min	Minimum elevation of all glaciers	m a.s.l.
g_all_elv_med	Median elevation of all glaciers	m a.s.l.
g_all_elv_mean	Mean elevation of all glaciers	m a.s.l.
g_all_elv_std	Standard deviation of all glacier elevation	m
g_elv_max_mean	Mean of maximum glacier elevations	m a.s.l.
g_elv_max_std	Standard deviation of maximum glacier elevations	m
g_elv_min_mean	Mean of minimum glacier elevations	m a.s.l.
g_elv_min_std	Standard deviation of minimum glacier elevations	m
g_elv_med_mean	Mean of median glacier elevations	m a.s.l.
g_elv_med_std	Standard deviation of median glacier elevations	m
g_elv_mean_mean	Mean of mean glacier elevations	m a.s.l.
g_elv_mean_std	Standard deviation of mean glacier elevations	m
g_all_slp_mean	Mean slope gradient of all glaciers	º
g_all_slp_std	Standard deviation of slope gradient of all glaciers	º
g_indv_slp_mean	Mean of mean glacier slope gradients	º
g_indv_slp_std	Standard deviation of mean glacier slope gradients	º
p_num	Number of glaciers with PMS slope	-
p_area_total	Total PMS slope area	m^2
p_area_mean	Mean PMS slope area	m^2
p_ratio_mean	Mean of PMS slope ratio	-
p_ratio_std	Standard deviation of PMS slope ratio	-
p_all_elv_max	Maximum elevation of all PMS slopes	m a.s.l.

Cont.

Abbreviation	Note	Unit
p_all_elv_min	Minimum elevation of all PMS slopes	m a.s.l.
p_all_elv_med	Median elevation of all PMS slopes	m a.s.l.
p_all_elv_mean	Mean elevation of all PMS slopes	m a.s.l.
p_all_elv_std	Standard deviation of all PMS slope elevation	m
p_elv_max_mean	Mean of maximum PMS slope elevations	m a.s.l.
p_elv_max_std	Standard deviation of maximum PMS slope elevations	m
p_elv_min_mean	Mean of minimum PMS slope elevations	m a.s.l.
p_elv_min_std	Standard deviation of minimum PMS slope elevations	m
p_elv_med_mean	Mean of median PMS slope elevations	m a.s.l.
p_elv_med_std	Standard deviation of median PMS slope elevations	m
p_elv_mean_mean	Mean of mean PMS slope elevations	m a.s.l.
p_elv_mean_std	Standard deviation of mean PMS slope elevations	m
p_all_slp_mean	Mean slope gradient of all PMS slope	º
p_all_slp_std	Standard deviation of slope gradient of all PMS slope	º
p_indv_slp_mean	Mean of mean PMS slope gradients	º
p_indv_slp_std	Standard deviation of PMS slope gradients	º
d_num	Number of debris-covered glaciers	-
d_area_total	Total debris-covered area	m^2
d_area_mean	Mean debris-covered area	m^2
d_ratio_mean	Mean of debris-covered area ratio	-
d_ratio_std	Standard deviation of debris-covered area ratio	-
d_all_elv_max	Maximum elevation of all debris-covered area	m a.s.l.
d_all_elv_min	Minimum elevation of all debris-covered area	m a.s.l.
d_all_elv_med	Median elevation of all debris-covered area	m a.s.l.
d_all_elv_mean	Mean elevation of all debris-covered area	m a.s.l.
d_all_elv_std	Standard deviation of all debris-covered area elevation	m
d_elv_max_mean	Mean of maximum debris-covered area elevations	m a.s.l.
d_elv_max_std	Standard deviation of maximum debris-covered area elevations	m
d_elv_min_mean	Mean of minimum debris-covered area elevations	m a.s.l.
d_elv_min_std	Standard deviation of minimum debris-covered area elevations	m
d_elv_med_mean	Mean of median debris-covered area elevations	m a.s.l.
d_elv_med_std	Standard deviation of median debris-covered area elevations	m
d_elv_mean_mean	Mean of mean debris-covered area elevations	m a.s.l.
d_elv_mean_std	Standard deviation of mean debris-covered area elevations	m
d_all_slp_mean	Mean slope gradient of all debris-covered area	º
d_all_slp_std	Standard deviation of slope gradient of all debris-covered area	º
d_indv_slp_mean	Mean of mean debris-covered area slope gradients	º
d_indv_slp_std	Standard deviation of debris-covered area slope gradients	º

Table S3. Information of ALOS PRISM data used in this study. Scene ID denote a unique number for original PRISM data. Frame and path are corresponding to longitudinal and latitudinal position. Pointing angle shows observing angle of PRISM sensor.

Scene ID	Acquisition date	Path	Frame	Pointing angle
ALPSMN051073030	9-Jan-2007	157	3030	-1.2
ALPSMN051073035	9-Jan-2007	157	3035	-1.2
ALPSMN051073040	9-Jan-2007	157	3040	-1.2
ALPSMN093083030	24-Oct-2007	155	3030	1.2
ALPSMN104753030	12-Jan-2008	157	3030	-1.2
ALPSMN104753035	12-Jan-2008	157	3035	-1.2
ALPSMN104753040	12-Jan-2008	157	3040	-1.2
ALPSMN104753045	12-Jan-2008	157	3045	-1.2
ALPSMN124883030	29-May-2008	157	3030	1.2
ALPSMN207883030	19-Dec-2009	158	3030	1.2
ALPSMN207883035	19-Dec-2009	158	3035	1.2
ALPSMN207883040	19-Dec-2009	158	3040	1.2
ALPSMN207883045	19-Dec-2009	158	3045	1.2
ALPSMN211383030	12-Jan-2010	154	3030	1.2
ALPSMN211383035	12-Jan-2010	154	3035	1.2
ALPSMN211383040	12-Jan-2010	154	3040	1.2
ALPSMN212113030	17-Jan-2010	157	3030	1.2
ALPSMN212113035	17-Jan-2010	157	3035	1.2
ALPSMN212113040	17-Jan-2010	157	3040	1.2
ALPSMN213863030	29-Jan-2010	155	3030	-1.2
ALPSMN213863035	29-Jan-2010	155	3035	-1.2
ALPSMN213863040	29-Jan-2010	155	3040	-1.2
ALPSMN221303030	21-Mar-2010	158	3030	1.2
ALPSMN221303035	21-Mar-2010	158	3035	1.2
ALPSMN221303040	21-Mar-2010	158	3040	1.2
ALPSMN221303045	21-Mar-2010	158	3045	1.2
ALPSMN223053030	2-Apr-2010	156	3030	1.2
ALPSMN223053035	2-Apr-2010	156	3035	1.2
ALPSMN229763030	18-May-2010	156	3030	-1.2
ALPSMN229763035	18-May-2010	156	3035	-1.2
ALPSMN229763040	18-May-2010	156	3040	-1.2
ALPSMN254853040	6-Nov-2010	158	3040	-1.2
ALPSMN254853045	6-Nov-2010	158	3045	-1.2
ALPSMN259083030	5-Dec-2010	157	3030	-1.2
ALPSMN259083035	5-Dec-2010	157	3035	-1.2

Cont.

Scene ID	Acquisition date	Path	Frame	Pointing angle
ALPSMN259083040	5-Dec-2010	157	3040	-1.2
ALPSMN259083045	5-Dec-2010	157	3045	-1.2
ALPSMN260833030	17-Dec-2010	155	3030	1.2
ALPSMN260833035	17-Dec-2010	155	3035	1.2
ALPSMN260833040	17-Dec-2010	155	3040	1.2
ALPSMN261563030	22-Dec-2010	158	3030	1.2
ALPSMN261563035	22-Dec-2010	158	3035	1.2
ALPSMN261563040	22-Dec-2010	158	3040	1.2
ALPSMN261563045	22-Dec-2010	158	3045	1.2
ALPSMN263313030	3-Jan-2011	156	3030	1.2
ALPSMN263313035	3-Jan-2011	156	3035	1.2
ALPSMN263313040	3-Jan-2011	156	3040	1.2
ALPSMN265793030	20-Jan-2011	157	3030	1.2
ALPSMN265793035	20-Jan-2011	157	3035	1.2
ALPSMN265793040	20-Jan-2011	157	3040	1.2
ALPSMN267543030	1-Feb-2011	155	3030	-1.2
ALPSMN267543035	1-Feb-2011	155	3035	-1.2
ALPSMN267543040	1-Feb-2011	155	3040	-1.2
ALPSMN271773035	2-Mar-2011	154	3035	-1.2
ALPSMN271773040	2-Mar-2011	154	3040	-1.2
ALPSMN272503030	7-Mar-2011	157	3030	-1.2
ALPSMN272503035	7-Mar-2011	157	3035	-1.2
ALPSMN272503040	7-Mar-2011	157	3040	-1.2

Table S4. Information of ALOS AVNIR2 data used in this study. Scene ID denote a unique number for original AVNIR2 data. Frame and path are corresponding to longitudinal and latitudinal position.

Scene ID	Acquisition date	Path	Frame
ALAV2A051073030	9-Jan-2007	157	3030
ALAV2A053553030	26-Jan-2007	158	3030
ALAV2A053553050	26-Jan-2007	158	3050
ALAV2A093083030	24-Oct-2007	155	3030
ALAV2A102273030	26-Dec-2007	156	3030
ALAV2A102273040	26-Dec-2007	156	3040
ALAV2A200443040	29-Oct-2009	155	3040
ALAV2A207883030	19-Dec-2009	158	3030
ALAV2A207883040	19-Dec-2009	158	3040
ALAV2A207883050	19-Dec-2009	158	3050
ALAV2A211383030	12-Jan-2010	154	3030
ALAV2A211383040	12-Jan-2010	154	3040
ALAV2A212113030	17-Jan-2010	157	3030
ALAV2A212113040	17-Jan-2010	157	3040
ALAV2A221303030	21-Mar-2010	158	3030
ALAV2A221303040	21-Mar-2010	158	3040
ALAV2A221303050	21-Mar-2010	158	3050
ALAV2A254853030	6-Nov-2010	158	3030
ALAV2A254853040	6-Nov-2010	158	3040
ALAV2A254853050	6-Nov-2010	158	3050
ALAV2A259083030	5-Dec-2010	157	3030
ALAV2A259083040	5-Dec-2010	157	3040
ALAV2A260833030	17-Dec-2010	155	3030
ALAV2A260833040	17-Dec-2010	155	3040
ALAV2A261563030	22-Dec-2010	158	3030
ALAV2A261563040	22-Dec-2010	158	3040
ALAV2A263313030	3-Jan-2011	156	3030
ALAV2A263313040	3-Jan-2011	156	3040