

# ATL07 Product Data Dictionary

Date Generated : 2020-02-03T22:48:07

Group: /		
Conventions	(Attribute)	CF-1.6
citation	(Attribute)	SET_BY_META
contributor_name	(Attribute)	Thomas E Neumann (thomas.neumann@nasa.gov), Thorsten Markus (thorsten.markus@nasa.gov), Suneel Bhardwaj (suneel.bhardwaj@nasa.gov) David W Hancock III (david.w.hancock@nasa.gov)
contributor_role	(Attribute)	Instrument Engineer, Investigator, Principle Investigator, Data Producer, Data Producer
creator_name	(Attribute)	SET_BY_META
date_created	(Attribute)	SET_BY_PGE
date_type	(Attribute)	UTC
description	(Attribute)	The data set (ATL07) contains along-track heights for sea ice and open water leads (at varying length scales) relative to the WGS84 ellipsoid (ITRF2014 reference frame) after adjustment for geoidal and tidal variations, and inverted barometer effects. Heig
featureType	(Attribute)	trajectory
geospatial_lat_max	(Attribute)	0.0
geospatial_lat_min	(Attribute)	0.0
geospatial_lat_units	(Attribute)	degrees_north
geospatial_lon_max	(Attribute)	0.0
geospatial_lon_min	(Attribute)	0.0
geospatial_lon_units	(Attribute)	degrees_east
granule_type	(Attribute)	ATL07
hdfversion	(Attribute)	SET_BY_PGE
history	(Attribute)	SET_BY_PGE
identifier_product_doi	(Attribute)	10.5067/ATLAS/ATL07.001
identifier_product_doi_authority	(Attribute)	http://dx.doi.org
identifier_product_format_version	(Attribute)	SET_BY_PGE
identifier_product_type	(Attribute)	ATL07
institution	(Attribute)	SET_BY_META
instrument	(Attribute)	SET_BY_META
keywords	(Attribute)	SET_BY_META
keywords_vocabulary	(Attribute)	SET_BY_META
level	(Attribute)	L3A
license	(Attribute)	Data may not be reproduced or distributed without including the citation for this product included in this metadata. Data may not be distributed in an altered form without the written permission of the ICESat-2 Science Project Office at NASA/GSFC.
naming_authority	(Attribute)	http://dx.doi.org
platform	(Attribute)	SET_BY_META
processing_level	(Attribute)	L3A
project	(Attribute)	SET_BY_META
publisher_email	(Attribute)	SET_BY_META
publisher_name	(Attribute)	SET_BY_META

publisher_url	(Attribute)	SET_BY_META		
references	(Attribute)	SET_BY_META		
short_name	(Attribute)	ATL07		
source	(Attribute)	SET_BY_META		
spatial_coverage_type	(Attribute)	Horizontal		
standard_name_vocabulary	(Attribute)	CF-1.6		
summary	(Attribute)	SET_BY_META		
time_coverage_duration	(Attribute)	SET_BY_PGE		
time_coverage_end	(Attribute)	SET_BY_PGE		
time_coverage_start	(Attribute)	SET_BY_PGE		
time_type	(Attribute)	CCSDS UTC-A		
title	(Attribute)	SET_BY_META		
<b>Group: /ancillary_data</b>				
Description	(Attribute)	Contains information ancillary to the data product. This may include product characteristics, instrument characteristics and/or processing constants.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
atlas_sdp_gps_epoch COMPACT	DOUBLE (1)	ATLAS Epoch Offset	seconds since 1980-01-06T00:00:00.000000Z Operations	Number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS Standard Data Product (SDP) epoch (2018-01-01:T00.00.00.000000 UTC). Add this value to delta time parameters to compute full gps_seconds (relative to the GPS epoch) for each data point.
control CONTIGUOUS	STRING (1)	Control File	1 Operations	PGE-specific control file used to generate this granule. To re-use, replace breaks (BR) with linefeeds.
data_end_utc COMPACT	STRING (1)	End UTC Time of Granule (CCSDS-A, Actual)	1 Derived	UTC (in CCSDS-A format) of the last data point within the granule.
data_start_utc COMPACT	STRING (1)	Start UTC Time of Granule (CCSDS-A, Actual)	1 Derived	UTC (in CCSDS-A format) of the first data point within the granule.
end_cycle COMPACT	INTEGER (1)	Ending Cycle	1 Derived	The ending cycle number associated with the data contained within this granule. The cycle number is the counter of the number of 91-day repeat cycles completed by the mission.
end_delta_time COMPACT	DOUBLE (1)	ATLAS End Time (Actual) time	seconds since 2018-01-01 Derived	Number of GPS seconds since the ATLAS SDP epoch at the last data point in the file. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed.
end_geoseg COMPACT	INTEGER (1)	Ending Geolocation Segment	1 Derived	The ending geolocation segment number associated with the data contained within this granule. ICESat granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created approximately every 20m from the start of the orbit to the end. The geolocation segments help align the ATLAS strong a weak beams and provide a common segment length for the L2 and higher products. The geolocation segment indices differ slightly from orbit-

				to-orbit because of the irregular shape of the Earth. The geolocation segment indices on ATL01 and ATL02 are only approximate because beams have not been aligned at the time of their creation.
end_gpssow COMPACT	DOUBLE (1)	Ending GPS SOW of Granule (Actual)	seconds Derived	GPS seconds-of-week of the last data point in the granule.
end_gpsweek COMPACT	INTEGER (1)	Ending GPSWeek of Granule (Actual)	weeks from 1980-01-06 Derived	GPS week number of the last data point in the granule.
end_orbit COMPACT	INTEGER (1)	Ending Orbit Number	1 Derived	The ending orbit number associated with the data contained within this granule. The orbit number increments each time the spacecraft completes a full orbit of the Earth.
end_region COMPACT	INTEGER (1)	Ending Region	1 Derived	The ending product-specific region number associated with the data contained within this granule. ICESat-2 data products are separated by geographic regions. The data contained within a specific region are the same for ATL01 and ATL02. ATL03 regions differ slightly because of different geolocation segment locations caused by the irregular shape of the Earth. The region indices for other products are completely independent.
end_rgt COMPACT	INTEGER (1)	Ending Reference Groundtrack	1 Derived	The ending reference groundtrack (RGT) number associated with the data contained within this granule. There are 1387 reference groundtrack in the ICESat-2 repeat orbit. The reference groundtrack increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft completes a full cycle.
granule_end_utc COMPACT	STRING (1)	End UTC Time of Granule (CCSDS-A, Requested)	1 Derived	Requested end time (in UTC CCSDS-A) of this granule.
granule_start_utc COMPACT	STRING (1)	Start UTC Time of Granule (CCSDS-A, Requested)	1 Derived	Requested start time (in UTC CCSDS-A) of this granule.
qa_at_interval COMPACT	DOUBLE (1)	QA Along-Track Interval	1 control	Statistics time interval for along-track QA data.
release COMPACT	STRING (1)	Release Number	1 Operations	Release number of the granule. The release number is incremented when the software or ancillary data used to create the granule has been changed.
start_cycle COMPACT	INTEGER (1)	Starting Cycle	1 Derived	The starting cycle number associated with the data contained within this granule. The cycle number is the counter of the number of 91-day repeat cycles completed by the mission.
start_delta_time COMPACT	DOUBLE (1)	ATLAS Start Time (Actual) time	seconds since 2018-01-01 Derived	Number of GPS seconds since the ATLAS SDP epoch at the first data point in the file. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed.
start_geoseg COMPACT	INTEGER (1)	Starting Geolocation Segment	1 Derived	The starting geolocation segment number associated with the data contained within this granule. ICESat granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created approximately every 20m from the start of the orbit to the end. The geolocation segments help align the

				ATLAS strong a weak beams and provide a common segment length for the L2 and higher products. The geolocation segment indices differ slightly from orbit-to-orbit because of the irregular shape of the Earth. The geolocation segment indices on ATL01 and ATL02 are only approximate because beams have not been aligned at the time of their creation.
start_gpssow COMPACT	DOUBLE (1)	Start GPS SOW of Granule (Actual)	seconds Derived	GPS seconds-of-week of the first data point in the granule.
start_gpsweek COMPACT	INTEGER (1)	Start GPSWeek of Granule (Actual)	weeks from 1980-01-06 Derived	GPS week number of the first data point in the granule.
start_orbit COMPACT	INTEGER (1)	Starting Orbit Number	1 Derived	The starting orbit number associated with the data contained within this granule. The orbit number increments each time the spacecraft completes a full orbit of the Earth.
start_region COMPACT	INTEGER (1)	Starting Region	1 Derived	The starting product-specific region number associated with the data contained within this granule. ICESat-2 data products are separated by geographic regions. The data contained within a specific region are the same for ATL01 and ATL02. ATL03 regions differ slightly because of different geolocation segment locations caused by the irregular shape of the Earth. The region indices for other products are completely independent.
start_rgt COMPACT	INTEGER (1)	Starting Reference Groundtrack	1 Derived	The starting reference groundtrack (RGT) number associated with the data contained within this granule. There are 1387 reference groundtrack in the ICESat-2 repeat orbit. The reference groundtrack increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft completes a full cycle.
version COMPACT	STRING (1)	Version	1 Operations	Version number of this granule within the release. It is a sequential number corresponding to the number of times the granule has been reprocessed for the current release.

**Group: /ancillary\_data/coarse\_surface\_finding**

Description	(Attribute)	Contains ancillary parameters related to the coarse surface finding algorithm.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
bin_c COMPACT	FLOAT (1)	bin size coarse histogram	meters Sea Ice ATBD	bin size of coarse histogram
coarse_lb_wins COMPACT	FLOAT (1)	Coarse_LowerrBounds	meters Sea Ice ATBD	Lower bound for signal photons when performing coarse tracking
coarse_ub_wins COMPACT	FLOAT (1)	Coarse_UpperBounds	meters Sea Ice ATBD	Upper bound for signal photons when performing coarse tracking
l COMPACT	FLOAT (1)	segment length coarse	meters Sea Ice ATBD	along track segment length coarse
n_ph_min COMPACT	INTEGER (1)	Minimum Number of Photons	1 Sea Ice ATBD	Minimum number of photons required for coarse track segment
si_conc_min COMPACT	FLOAT (1)	Min SI Concentration Thresh	1 Sea Ice ATBD	Minimum sea ice concentration percentage value for which to process data.
th_d_bot COMPACT	FLOAT (1)	Bottom threshold distance from mode coarse	meters Sea Ice ATBD	Bottom distance from mode coarse
th_d_top COMPACT	FLOAT (1)	Top threshold distance from mode coarse	meters Sea Ice ATBD	Top distance from mode coarse
th_fm	FLOAT	threshold fraction of	1	fraction of histogram peak coarse

COMPACT	(1)	peak coarse	Sea Ice ATBD	
th_pc COMPACT	FLOAT (1)	threshold percentage cloud cover coarse	1 Sea Ice ATBD	percentage cloud cover coarse
th_tc COMPACT	FLOAT (1)	Threshold height deviations	1 Sea Ice ATBD	height deviations from surface or adjacent strong beam
<b>Group: /ancillary_data/fine_surface_finding</b>				
Description	(Attribute)	Contains ancillary parameters related to the fine surface finding algorithm.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
bin_f COMPACT	FLOAT (1)	bin size of fine histogram	meters Sea Ice ATBD	bin size of fine histogram along track segment length
delta_h_tab COMPACT	FLOAT (1)	h table spacing	meters Sea Ice ATBD	the waveform table spacing for the height (h) dimension
delta_w_tab COMPACT	FLOAT (1)	w table spacing	meters Sea Ice ATBD	the waveform table spacing for the width (w) dimension
h_diff_limit COMPACT	FLOAT (1)	Max Ht Difference	meters Sea Ice ATBD	Maximum height difference between the two weighted Gaussian mean from the initial tracked height (units = meters)
lb_h_tab COMPACT	FLOAT (1)	lower bound of h table	meters Sea Ice ATBD	lower bound of h table
lb_oc_switch_strong COMPACT	FLOAT (1)	Lower bound of overlapping control for strong beam	photons/shot ATBD section 4.2.2.4	Lower bound of photon rate overlapping control for strong beam when overlap is turned off
lb_oc_switch_weak COMPACT	FLOAT (1)	Lower bound of overlapping control for weak beam	photons/shot ATBD section 4.2.2.4	Lower bound of photon rate overlapping control for weak beam when overlap is turned off
lb_w_tab COMPACT	FLOAT (1)	lower bound of w table	meters Sea Ice ATBD	lower bound of w table
lb_win_s COMPACT	FLOAT (1)	lower bound window signal	meters Sea Ice ATBD	window (Ws) containing signal photons
n_photon_min COMPACT	FLOAT (1)	Minimum number of photons	1 Sea Ice ATBD	Minimum fraction of photons needed for tracking
n_photon_trim COMPACT	INTEGER (1)	Min Photons	1 Sea Ice ATBD	Minimum number of photons for trimming leading/trailing bins
n_s COMPACT	INTEGER (1)	number photons in W_s	1 Sea Ice ATBD	photons in W_s
n_spec_scale COMPACT	FLOAT (1)	Specular Scaling Value	1 Sea Ice ATBD	Scaling parameter used for scaling value of N_SPECULAR for the weak beam. Specular returns for weak beam are defined as a shot having more photons than (N_SPECULAR/N_SPEC_SCALE)
n_specular COMPACT	FLOAT (1)	number photons Specular returns	1 Sea Ice ATBD	Specular returns limits
n_w COMPACT	INTEGER (1)	number of standard deviations	1 Sea Ice ATBD	number of standard deviations
overlap_switch COMPACT	INTEGER (1)	Overlap Segments	1 Sea Ice ATBD	Use of overlapping height segments (1 = yes, 0 = no)  Flag Values: ['0', '1'] Flag Meanings: ['no', 'yes']
tep_used_gt1_strong COMPACT	INTEGER (1)	TEP Table PCE1_Strong	1 Sea Ice ATBD	TEP used in table generation for strong beam of ground track 1 (1 or 3)
tep_used_gt1_weak COMPACT	INTEGER (1)	TEP Table PCE1_Weak	1 Sea Ice ATBD	TEP used in table generation for weak beam of ground track 1 (1 or 3)
tep_used_gt2_strong COMPACT	INTEGER (1)	TEP Table PCE2_Strong	1 Sea Ice ATBD	TEP used in table generation for strong beam of ground track 2 (1 or 3)

tep_used_gt2_weak COMPACT	INTEGER (1)	TEP Table PCE2_Weak	1 Sea Ice ATBD	TEP used in table generation for weak beam of ground track 2 (1 or 3)
tep_used_gt3_strong COMPACT	INTEGER (1)	TEP Table PCE3_Strong	1 Sea Ice ATBD	TEP used in table generation for strong beam of ground track 3 (1 or 3)
tep_used_gt3_weak COMPACT	INTEGER (1)	TEP Table PCE3_Weak	1 Sea Ice ATBD	TEP used in table generation for weak beam of ground track 3 (1 or 3)
ub_h_tab COMPACT	FLOAT (1)	upper bound of h table	meters Sea Ice ATBD	the waveform upper bound for the height (h) dimension
ub_length_strong COMPACT	INTEGER (1)	upper bound segment length strong	1 Sea Ice ATBD	upper bound of segment length strong beam
ub_length_weak COMPACT	INTEGER (1)	upper bound segment length weak	1 Sea Ice ATBD	upper bound of segment length weak beam
ub_oc_switch_strong COMPACT	FLOAT (1)	Upper bound of overlapping control for strong beam	photons/shot ATBD section 4.2.2.4	Upper bound of photon rate overlapping control for strong beam when overlap is turned off
ub_oc_switch_weak COMPACT	FLOAT (1)	Upper bound of overlapping control for weak beam	photons/shot ATBD section 4.2.2.4	Upper bound of photon rate overlapping control for weak beam when overlap is turned off
ub_w_tab COMPACT	FLOAT (1)	upper bound of w table	meters Sea Ice ATBD	the waveform upper bound for the width (w) dimension
ub_win_s COMPACT	FLOAT (1)	upper bound window signal	meters Sea Ice ATBD	window (Ws) containing signal photons

**Group: /ancillary\_data/sea\_ice**

Description	(Attribute)	Contains ancillary parameters related to sea ice.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
geoseg_max COMPACT	INTEGER (1)	Maximum Segment Id	1 Operations	Indicates the maximum segment_id to process (if specified in control). The actual maximum processed may be greater than specified.
geoseg_min COMPACT	INTEGER (1)	Minimum Segment ID	1 Operations	Indicates the minimum segment_id to process (if specified in control)
min_segs_count COMPACT	INTEGER (1)	Minimum Segments Count	1 Sea Ice ATBD	ATL07 granules with less than this number of strong beam sea ice segments will be marked as failed.
proc_beam_pair1 COMPACT	INTEGER (1)	Processing Flag for Beam Pair 1	1 Operations	Indicates if beam pair 1 was processed.  Flag Values: ['0', '1'] Flag Meanings: ['not_processed', 'processed']
proc_beam_pair2 COMPACT	INTEGER (1)	Processing Flag for Beam Pair 2	1 Operations	Indicates if beam pair 2 was processed.  Flag Values: ['0', '1'] Flag Meanings: ['not_processed', 'processed']
proc_beam_pair3 COMPACT	INTEGER (1)	Processing Flag for Beam Pair 3	1 Operations	Indicates if beam pair 3 was processed.  Flag Values: ['0', '1'] Flag Meanings: ['not_processed', 'processed']
proc_interval COMPACT	INTEGER (1)	Processing interval	1 Operations	The number of 20 meter segments of data processed in one chunk
region COMPACT	INTEGER (1)	Region Index	1 Operations	The index to the geographic region covered within this granule (0=no region boundaries enforced).

**Group: /ancillary\_data/surface\_classification**

Description	(Attribute)	Contains ancillary parameters related to the surface classification algorithm.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description

b1 COMPACT	FLOAT (1)	max backgr (gray ice)	1 Sea Ice ATBD	max backgr (gray ice)
beam_gain COMPACT	FLOAT (6)	relative beam gain for beams 1 through 6	1 Sea Ice ATBD	Relative gains for beams 1 through 6 where N is the beam number (Note: Beams 1, 3, and 5 are the strong beams)
height_pct COMPACT	FLOAT (1)	Percentile Hts	percentile Sea Ice ATBD	Percentile of sorted heights
p1 COMPACT	FLOAT (1)	pr (clouds)	1 Sea Ice ATBD	photon rate (clouds)
p2 COMPACT	FLOAT (1)	pr (snow)	1 Sea Ice ATBD	photon rate (snow)
p3 COMPACT	FLOAT (1)	pr (shadow)	1 Sea Ice ATBD	photon rate (shadow)
p4 COMPACT	FLOAT (1)	pr (specular)	1 Sea Ice ATBD	photon rate (specular)
theta_cntl COMPACT	FLOAT (1)	Solar elevation for use of background rate	1 Sea Ice ATBD	Solar elevation for controlling use of background rate
theta_nlb COMPACT	FLOAT (1)	Solar elevation normalization lower bound	degrees ATBD section 4.3.1.4	Solar elevation normalization lower bound for use of normalized background rate
theta_ref COMPACT	FLOAT (1)	Solar elevation normalization angle	degrees ATBD section 4.3.1.4	Solar elevation normalization angle for use of normalized background rate
w1 COMPACT	FLOAT (1)	max width (dark smooth lead)	meters Sea Ice ATBD	max width (dark smooth lead)
w2 COMPACT	FLOAT (1)	max width (dark rough lead)	meters Sea Ice ATBD	max width (dark rough lead)

**Group: /atlas\_impulse\_response**

Description	(Attribute)	Contains parameters to characterize the ATLAS pulse shape, derived from the Transmitter Echo Pulse (TEP) data for the two PCEs that contain TEP events.		
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**Group: /atlas\_impulse\_response/pcex\_spotx**

Description	(Attribute)	Contains parameters to characterize the ATLAS pulse shape, derived from the Transmitter Echo Pulse data for a single PCE.		
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Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
tep_bckgrd CHUNKED	INTEGER (:)	TEP Background	counts ATL03	The average number of counts in the TEP histogram bins, after excluding bins that likely contain the transmit pulse.
tep_duration CHUNKED	DOUBLE (:)	TEP Duration	seconds ATL03	The duration (or width) of data in the TEP histogram. Will generally be greater than 10 seconds.
tep_hist CHUNKED	DOUBLE (:)	TEP Histogram	counts ATL03	The normalized number of counts in each bin of the TEP histogram.
tep_hist_sum CHUNKED	INTEGER_8 (:)	TEP Histogram Sum	counts ATL03	The total number of counts in the TEP histogram, after removing the background.
tep_hist_time CHUNKED	DOUBLE (:)	TEP Histogram Time	seconds ATL03	The times associated with the TEP histogram bin centers, measured from the laser transmit time.
tep_tod CHUNKED	DOUBLE (:)	TEP Time Of Day time	seconds since 2018-01-01 ATL03	The time of day at of the start of the data within the TEP histogram, in seconds since the ATLAS SDP GPS Epoch. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be

				computed.
<b>Group: /gtx</b>				
Description	(Attribute)	This ground contains parameters and subgroups related a specific groundtrack.		
data_rate	(Attribute)	Each subgroup identifies its particular data rate.		
<b>Group: /gtx/sea_ice_segments</b>				
Description	(Attribute)	Top group for sea ice segments as computed by the ATBD algorithm		
data_rate	(Attribute)	Data within this group are stored at the variable segment rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
delta_time CHUNKED	DOUBLE (:)	Elapsed GPS seconds time	seconds since 2018-01-01 telemetry	Number of GPS seconds since the ATLAS SDP epoch. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed.
geoseg_beg CHUNKED	INTEGER (:)	Beginning GEOSEG	1 Sea Ice ATBD	Geolocation segment (geoseg) ID associated with the first photon used in this sea ice segment
geoseg_end CHUNKED	INTEGER (:)	Ending GEOSEG	1 Sea Ice ATBD	Geolocation segment (geoseg) ID associated with the last photon used in this sea ice segment
height_segment_id CHUNKED	INTEGER (:)	Identifier of each height segment	1 ATBD, section 5.2	Identifier of each height segment
latitude CHUNKED	DOUBLE (:)	Latitude latitude	degrees_north ATBD, section 4.4	Latitude, WGS84, North=+, Lat of segment center
longitude CHUNKED	DOUBLE (:)	Longitude longitude	degrees_east ATBD, section 4.4	Longitude, WGS84, East=+, Lon of segment center
seg_dist_x CHUNKED	DOUBLE (:)	Along track distance	meters Sea Ice ATBD	Along-track distance from the equator crossing to the segment center.
<b>Group: /gtx/sea_ice_segments/geolocation</b>				
Description	(Attribute)	Contains parameters related to geolocation.		
data_rate	(Attribute)	Data within this group are stored at the sea_ice_height segment rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
beam_azimuth CHUNKED	FLOAT (:)	beam azimuth	degrees_east Sea Ice ATBD	The direction, eastwards from north, of the laser beam vector as seen by an observer at the laser ground spot viewing toward the spacecraft (i.e., the vector from the ground to the spacecraft). When the spacecraft is precisely at the geodetic zenith, the value will be 99999 degrees.
beam_coelev CHUNKED	FLOAT (:)	beam co-elevation	degrees Sea Ice ATBD	Co-elevation (CE) is direction from vertical of the laser beam as seen by an observer located at the laser ground spot.
ref_atm_delay CHUNKED	FLOAT (:)	Reference Photon Atm. Path Delay	meters Sea Ice ATBD	Atmospheric path delay, in range, for the reference photon.
ref_atm_delay_derivative CHUNKED	FLOAT (:)	Derivative of Atm. Path Delay	meters/meter Sea Ice ATBD	Atmospheric path delay derivative with respect to ellipsoid for the reference photon, in meters per meter.
rgt CHUNKED	INTEGER_2 (:)	Reference Ground track	1 Sea Ice ATBD	The reference ground track (RGT) is the track on the earth at which a specified unit vector within the observatory is pointed. Under nominal operating conditions, there will be no data collected along the RGT, as the RGT is spanned by GT3 and GT4.

				During slews or off-pointing, it is possible that ground tracks may intersect the RGT. The ICESat-2 mission has 1387 RGTs.
sigma_h CHUNKED	FLOAT (:)	height uncertainty	1 Sea Ice ATBD	Estimated uncertainty for the reference photon bounce point ellipsoid height: 1- sigma (m). Error estimates for all other photons in the group are computed with the scale defined below.
sigma_lat CHUNKED	FLOAT (:)	latitude uncertainty	1 Sea Ice ATBD	Estimated uncertainty for the reference photon bounce point geodetic latitude: 1- sigma (degrees). Applies to all other photons in the group
sigma_lon CHUNKED	FLOAT (:)	longitude uncertainty	degrees Sea Ice ATBD	Estimated uncertainty for the reference photon bounce point east longitude: 1- sigma (degrees). Applies to all other photons in the group.
solar_azimuth CHUNKED	FLOAT (:)	solar azimuth	degrees_east Sea Ice ATBD	The direction, eastwards from north, of the sun vector as seen by an observer at the laser ground spot.
solar_elevation CHUNKED	FLOAT (:)	solar elevation	degrees Sea Ice ATBD	Solar Angle above or below the plane tangent to the ellipsoid surface at the laser spot. Positive values mean the sun is above the horizon, while negative values mean it is below the horizon. The effect of atmospheric refraction is not included. This is a low precision value, with approximately TBD degree accuracy.

**Group: /gtx/sea\_ice\_segments/geophysical**

Description	(Attribute)	Contains geophysical parameters and corrections used to correct photon heights for geophysical effects, such as tides.		
data_rate	(Attribute)	Data within this group are stored at the sea_ice_height segment rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
height_segment_dac CHUNKED	FLOAT (:)	Dynamic Atmosphere Correction	meters Sea Ice ATBD	Dynamic Atmospheric Correction (DAC) includes inverted barometer (IB) effect.
height_segment_earth CHUNKED	FLOAT (:)	Earth Tide	meters Sea Ice ATBD	Solid Earth Tide
height_segment_geoid CHUNKED	FLOAT (:)	EGM2008 Geoid	meters Sea Ice ATBD	Geoid height above WGS-84 reference ellipsoid (range -107 to 86m), based on the EGM2008 model.
height_segment_ib CHUNKED	FLOAT (:)	Inverted barometer effect	meters ATBD, section 4.2	Inverted barometer effect calculated from surface pressure
height_segment_load CHUNKED	FLOAT (:)	Load Tide	meters Sea Ice ATBD	Load Tide - Local displacement due to Ocean Loading (-6 to 0 cm).
height_segment_lpe CHUNKED	FLOAT (:)	Equilibrium Tide	meters Sea Ice ATBD	Long period equilibrium tide self-consistent with ocean tide model (+-0.04m). (dependent only on time and latitude)
height_segment_mss CHUNKED	FLOAT (:)	DTU13 Mean Sea Surface	meters Sea Ice ATBD	Mean sea surface height above WGS-84 reference ellipsoid (range: -105 to 87m), based on the DTU13 model.
height_segment_ocean CHUNKED	FLOAT (:)	Ocean Tide	meters Sea Ice ATBD	Ocean Tides including diurnal and semi-diurnal (harmonic analysis), and longer period tides (dynamic and self-consistent equilibrium)
height_segment_pole CHUNKED	FLOAT (:)	Pole Tide	meters Sea Ice ATBD	Pole Tide -Rotational deformation due to polar motion (-1.5 to 1.5 cm).
height_segment_ps CHUNKED	FLOAT (:)	sea level pressure pressure	Pa ATL09	Sea Level Pressure (Pa)
height_segment_t2m CHUNKED	FLOAT (:)	temperature_at_2m temperature	K ATL09	Temperature at 2m above the displacement height (K)
height_segment_u2m CHUNKED	FLOAT (:)	Eastward_wind_at_2m eastward_wind	m s-1 ATL09	Eastward wind at 2m above the displacement height (m/s-1)

height_segment_v2m CHUNKED	FLOAT (:)	Northward_wind_at_2m northward_wind	m s-1 ATL09	Northward wind at 2m above the displacement height (m/s-1)
<b>Group: /gtx/sea_ice_segments/heights</b>				
Description	(Attribute)	Contains parameters relating to the calculated surface height for one Ground Track. As ICESat-2 orbits the earth, sequential transmit pulses illuminate six ground tracks on the surface of the earth.		
data_rate	(Attribute)	Data within this group are stored at the sea_ice_height segment rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
across_track_distance CHUNKED	FLOAT (:)	Across Track Distance	meters ATBD, section 4.2.4	Across track distance of photons averaged over the sea ice height segment.
height_segment_asr_calc CHUNKED	FLOAT (:)	Calculated Apparent Surface Reflectivity	1 Sea Ice ATBD	Computed apparent surface reflectance for the sea ice segment.
height_segment_confidence CHUNKED	FLOAT (:)	Surface height confidence	1 ATBD, section 4.2.4.2	Confidence level in the surface height estimate based on the number of photons; the background noise rate; and the error analysis
height_segment_fit_quality_flag CHUNKED	INTEGER_1 (:)	height Quality Flag	1 ATBD, section 4.2.4.2	Flag describing the quality of the results of the along-track fit. (-1=height value is invalid; 1=ngrid_w < wlength/2; 2=ngrid_w >= wlength/2; 3=ngrid_dt < dtlength/2; 4=ngrid_dt >= dtlength/2; 5=ngrid_dt >= (dtlength-2); where 1 is best and 5 is poor). Heights are reported even if this flag indicates the height is invalid.  Flag Values: ['-1', '1', '2', '3', '4', '5'] Flag Meanings: ['invalid', 'best', 'high', 'med', 'low', 'poor']
height_segment_height CHUNKED	FLOAT (:)	height of segment surface	meters ATBD, section 4.2.2.4	Mean height from along-track segment fit determined by the sea ice algorithm
height_segment_htcorr_skew CHUNKED	FLOAT (:)	Height Correction for Skew	meters ATBD, section 4.2.6	height corection for skew
height_segment_length_seg CHUNKED	FLOAT (:)	length of segment	meters ATBD, section 4.2.2.4	along-track length of segment containing n_photons_actual
height_segment_n_pulse_seg CHUNKED	INTEGER (:)	number of laser pulses	1 ATBD, section 4.2.2.4	number of laser pulses
height_segment_quality CHUNKED	INTEGER_1 (:)	Height Segment Quality Flag	1 ATBD, section 4.2.4	Height segment quality flag, 1 is good quality, 0 is bad depending on fit, wguassian, or layer flag  Flag Values: ['0', '1'] Flag Meanings: ['bad_quality', 'good_quality']
height_segment_rms CHUNKED	FLOAT (:)	height rms	meters ATBD, section 4.2.2.4	RMS difference between sea ice modeled and observed photon height distribution
height_segment_ssh_flag CHUNKED	INTEGER_1 (:)	Sea Surface Flag	1 ATBD, section 4.3	Identifies the height segments that are candidates for use as sea surface reference in freeboard calculations in ATL10. 0 = sea ice; 1 = sea surface  Flag Values: ['0', '1'] Flag Meanings: ['sea_ice', 'sea_surface']
height_segment_surface_error_est CHUNKED	FLOAT (:)	h surface error est	meters ATBD, section 4.2.2.4	Error estimate of the surface height
height_segment_type CHUNKED	INTEGER_1 (:)	Segment surface type	1 ATBD, section 4.3	Value that indicates segment surface type as sea ice or different types of sea surface. 0=cloud covered: rsurf  Flag Values: ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9'] Flag Meanings: ['cloud_covered', 'other', 'specular_lead_low_w_bkg', 'specular_lead_low', 'specular_lead_high_w_bkg', 'specular_lead_high', 'dark_lead_smooth_w_bkg', 'dark_lead_smooth',

				'dark_lead_rough_w_bkg', 'dark_lead_rough']
height_segment_w_gaussian CHUNKED	FLOAT (:)	width of best fit gaussian	meters ATBD, section 4.2.4	width of best fit gaussian
<b>Group: /gtx/sea_ice_segments/stats</b>				
Description	(Attribute)	Contains parameters related to quality and corrections on the sea ice height paramters		
data_rate	(Attribute)	Data within this group are stored at the sea_ice_height segment rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
asr_25 CHUNKED	FLOAT (:)	Apparent Surface Reflectance 25hz	1 Sea Ice ATBD	Apparent surface reflectance at 25 hz, averaged to the sea ice segment.
backgr_calc CHUNKED	FLOAT (:)	background count rate calculated	hz ATBD, section 4.2.3	Calculated background count rate based on sun angle, surface slope, unit reflectance
backgr_r_200 CHUNKED	FLOAT (:)	Background rate 200 hz	hz ATL09	Background count rate, averaged over the segment based on ATLAS 50 pulse counts
backgr_r_25 CHUNKED	FLOAT (:)	Background rate 25hz	hz ATL09	Background count rate, averaged over the segment based on 25 hz atmosphere
background_int_height CHUNKED	FLOAT (:)	Height of column used in background calculation	meters ATBD, section 7.3	The height of the altimetric range window after subtracting the height span of the signal photon events in the 50-shot span
background_r_norm CHUNKED	FLOAT (:)	Normalized background (50-shot)	hz ATBD section 4.3.1.3	Background rate normalized to a fixed solar elevation angle
bsnow_con CHUNKED	INTEGER_1 (:)	Blowing snow confidence	1 ATL09	Blowing snow confidence
bsnow_h CHUNKED	FLOAT (:)	Blowing snow top h	meters ATL09	Blowing snow layer top height
cloud_flag_asr CHUNKED	INTEGER_2 (:)	Cloud Flag ASR	1 Atmosphere ATBD	Cloud flag (probability) from apparent surface reflectance. 0=clear with high confidence; 1=clear with medium confidence; 2=clear with low confidence; 3=cloudy with low confidence; 4=cloudy with medium confidence; 5=cloudy with high confidence; 6=unknown  Flag Values: ['0', '1', '2', '3', '4', '5', '6'] Flag Meanings: ['clear_with_high_confidence', 'clear_with_medium_confidence', 'clear_with_low_confidence', 'cloudy_with_low_confidence', 'cloudy_with_medium_confidence', 'cloudy_with_high_confidence', 'unknown']
cloud_flag_atm CHUNKED	INTEGER_1 (:)	Cloud Flag Atm	1 Atmosphere ATBD	Number of layers found from the backscatter profile using the DDA layer finder.
ds_si_hist_bins CHUNKED	INTEGER (:)	Sea Ice Histogram Bins Dimension Scale	1 SeaIce ATBD	Dimension scale indexing the sea ice histogram bins. The bin heights must be computed from information contained within the same group as the histogram.
exmax_mean_1 CHUNKED	FLOAT (:)	Exmax Mean 1	meters sea ice ATBD Appendix E	exmax height mean 1
exmax_mean_2 CHUNKED	FLOAT (:)	Exmax Mean 2	meters sea ice ATBD Appendix E	exmax height mean 2
exmax_mix CHUNKED	FLOAT (:)	Exmax Mix	meters sea ice ATBD Appendix E	exmax height mix ratio
exmax_stdev_1 CHUNKED	FLOAT (:)	Exmax Stdev 1	meters sea ice ATBD Appendix E	exmax height standard deviation 1

exmax_stdev_2 CHUNKED	FLOAT (:)	Exmax Stdev 2	meters sea ice ATBD Appendix E	exmax height standard deviation 2
fpb_avg_dt CHUNKED	FLOAT (:)	fpb correction average deadtime	ns Sea Ice ATBD	FPB correction average dead time
fpb_corr CHUNKED	FLOAT (:)	first photon bias correction	meters Sea Ice ATBD	Estimated first-photon bias(fpb) correction to mean segment height
fpb_corr_width CHUNKED	FLOAT (:)	fpb correction width	ns Sea Ice ATBD	FPB correction width
fpb_strength CHUNKED	FLOAT (:)	fpb correction strength	photons/shot Sea Ice ATBD	FPB correction strength
height_coarse_mn CHUNKED	FLOAT (:)	Coarse Track Height Mean	meters sea ice ATBD , sect 4.2.1.2	height mean of coarse tracker
height_coarse_stdev CHUNKED	FLOAT (:)	Coarse Height Sdev	meters sea ice ATBD , sect 4.2.1.2	height standard deviation of coarse tracker
height_filter_05 CHUNKED	FLOAT (:)	Height Filter 5th Percentile	meters sea ice ATBD , sect 4.2.1.2	height fifth percentile used in the ssh height filter
height_filter_min CHUNKED	FLOAT (:)	Height Filter Min	meters sea ice ATBD , sect 4.2.1.2	height minimum used in the ssh height filter
hist_mean_h CHUNKED	FLOAT (:)	photon heights mean	meters ATBD, section 4.2.2.4	Mean of the n_fit_photons heights
hist_median_h CHUNKED	FLOAT (:)	trimmed photon heights median	meters ATBD, section 4.2.3.1	Median of the n_fit_photons heights
hist_photon_bin_size CHUNKED	FLOAT (:)	height histogram bin size	meters ATBD, section 4.2.2.4	bin size of photon height histogram
hist_photon_bottom CHUNKED	FLOAT (:)	height histogram minimum	meters ATBD, section 4.2.2.4	lower bound of height histogram
hist_photon_heights CHUNKED	INTEGER_2 (: x :)	photon heights histogram	1 ATBD, section 4.2.2.4	Histogram of the n_fit_photons heights
hist_photon_top CHUNKED	FLOAT (:)	height histogram maximum	meters ATBD, section 4.2.2.4	upper bound of height histogram
hist_w CHUNKED	FLOAT (:)	Segment histogram width estimate	meters ATBD, section 4.2.2.4	Segment histogram width estimate
ice_conc CHUNKED	FLOAT (:)	sea ice concentration	1 ATBD, section 3.1.4	sea ice concentration
layer_flag CHUNKED	INTEGER_2 (:)	Consolidated cloud flag	1 Atmosphere ATBD	This flag is a combination of multiple flags (cloud_flag_atm, cloud_flag_asr, and bsnow_con) and takes daytime/nighttime into consideration. A value of 1 means clouds or blowing snow are likely present. A value of 0 indicates the likely absence of clouds or blowing snow.  Flag Values: ['0', '1'] Flag Meanings: ['likely_clear', 'likely_cloudy']
msw_flag CHUNKED	INTEGER_1 (:)	Multiple Scattering Warning Flag	1 Atmosphere ATBD	Multiple Scattering warning flag. The multiple scattering warning flag (ATL09 parameter msw_flag) has values from -1 to 5 where zero means no multiple scattering and 5 the greatest. If no layers were detected, then msw_flag = 0. If blowing snow is detected and its estimated optical depth is greater than or equal to 0.5, then msw_flag = 5. If the blowing snow optical depth is less than 0.5, then msw_flag = 4. If no blowing snow is detected but there are cloud or aerosol layers detected, the msw_flag assumes

				values of 1 to 3 based on the height of the bottom of the lowest layer: < 1 km, msw_flag = 3; 1-3 km, msw_flag = 2; > 3km, msw_flag = 1. A value of -1 indicates that the signal to noise of the data was too low to reliably ascertain the presence of cloud or blowing snow. We expect values of -1 to occur only during daylight.  Flag Values: ['-1', '0', '1', '2', '3', '4', '5'] Flag Meanings: ['cannot_determine', 'no_layers', 'layer_gt_3km', 'layer_between_1_and_3_km', 'layer_lt_1km', 'blow_snow_od_lt_0.5', 'blow_snow_od_gt_0.5']
n_photons_actual CHUNKED	INTEGER_2 (:)	Number of photons found for the segment	1 ATBD, section 4.2.2.4	Number of photons gathered
n_photons_define CHUNKED	INTEGER_2 (:)	Number of photons defining the segment	1 ATBD, section 4.2.2.4	Number of photons to gather.
n_photons_used CHUNKED	INTEGER_2 (:)	Number of photons used for fit	1 ATBD, section 4.2.2.4	Number of photons in the trimmed histogram.
photon_rate CHUNKED	FLOAT (:)	photon rate	photons/shot ATBD, section 4.2.2.4	photon count rate, averaged over segment
trim_height_bottom CHUNKED	FLOAT (:)	minimum height of trimmed photons	meters ATBD, section 4.2.2.4	minimum height of trimmed photons used in the surface calculation procedure
trim_height_top CHUNKED	FLOAT (:)	maximum height of trimmed photons	meters ATBD, section 4.2.2.4	maximum height of trimmed photons used in the surface calculation procedure
<b>Group: /orbit_info</b>				
Description	(Attribute)	Contains orbit information.		
data_rate	(Attribute)	Varies. Data are only provided when one of the stored values (besides time) changes.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
crossing_time CHUNKED	DOUBLE (:)	Ascending Node Crossing Time time	seconds since 2018-01-01 POD/PPD	The time, in seconds since the ATLAS SDP GPS Epoch, at which the ascending node crosses the equator. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed.
cycle_number CHUNKED	INTEGER_1 (:)	Cycle Number	1 Operations	A count of the number of exact repeats of this reference orbit.
lan CHUNKED	DOUBLE (:)	Ascending Node Longitude	degrees_east POD/PPD	Longitude at the ascending node crossing.
orbit_number CHUNKED	UINT_2_LE (:)	Orbit Number	1 Operations	Unique identifying number for each planned ICESat-2 orbit.
rgt CHUNKED	INTEGER_2 (:)	Reference Ground track	1 POD/PPD	The reference ground track (RGT) is the track on the earth at which a specified unit vector within the observatory is pointed. Under nominal operating conditions, there will be no data collected along the RGT, as the RGT is spanned by GT3 and GT4. During slews or off-pointing, it is possible that ground tracks may intersect the RGT. The ICESat-2 mission has 1387 RGTs.
sc_orient CHUNKED	INTEGER_1 (:)	Spacecraft Orientation	1 POD/PPD	This parameter tracks the spacecraft orientation between forward, backward and transitional flight modes. ICESat-2 is considered to be flying forward when the weak beams are leading the strong beams;

				and backward when the strong beams are leading the weak beams. ICESat-2 is considered to be in transition while it is maneuvering between the two orientations. Science quality is potentially degraded while in transition mode.  Flag Values: ['0', '1', '2'] Flag Meanings: ['backward', 'forward', 'transition']
sc_orient_time CHUNKED	DOUBLE (:)	Time of Last Spacecraft Orientation Change time	seconds since 2018-01-01 POD/PPD	The time of the last spacecraft orientation change between forward, backward and transitional flight modes, expressed in seconds since the ATLAS SDP GPS Epoch. ICESat-2 is considered to be flying forward when the weak beams are leading the strong beams; and backward when the strong beams are leading the weak beams. ICESat-2 is considered to be in transition while it is maneuvering between the two orientations. Science quality is potentially degraded while in transition mode. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed.

**Group: /quality\_assessment**

Description	(Attribute)	Contains quality assessment data. This may include QA counters, QA along-track data and/or QA summary data.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
qa_granule_fail_reason COMPACT	INTEGER (1)	Granule Failure Reason	1 Operations	Flag indicating granule failure reason. 0=no failure; 1=processing error; 2=Insufficient output data was generated; 3=TBD Failure; 4=TBD_Failure; 5=other failure.  Flag Values: ['0', '1', '2', '3', '4', '5'] Flag Meanings: ['no_failure', 'PROCESS_ERROR', 'INSUFFICIENT_OUTPUT', 'failure_3', 'failure_4', 'OTHER_FAILURE']
qa_granule_pass_fail COMPACT	INTEGER (1)	Granule Pass Flag	1 Operations	Flag indicating granule quality. 0=granule passes automatic QA. 1=granule fails automatic QA.  Flag Values: ['0', '1'] Flag Meanings: ['PASS', 'FAIL']