ATL08 Product Data Dictionary

Date Generated : 2020-02-03T22:48:08

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)	This data set (ATL08) contains along-track heights above the WGS84 ellipsoid (ITRF2014 reference frame) for the ground and canopy surfaces. The canopy and ground surfaces are processed in fixed 100 m data segments, which typically contain more than 100 sig
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)	ATL08
hdfversion	(Attribute)	SET_BY_PGE
history	(Attribute)	SET_BY_PGE
identifier_file_uuid	(Attribute)	SET_BY_PGE
identifier_product_doi	(Attribute)	10.5067/ATLAS/ATL08.001
identifier_product_doi_authority	(Attribute)	http://dx.doi.org
identifier_product_format_version	(Attribute)	SET_BY_PGE
identifier_product_type	(Attribute)	ATL08
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)	ATL08		
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		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
ds_metrics CONTIGUOUS	INTEGER_1 (9)	Metrics	1	Dimension scale for metrics. Flag Values: ['1', '2', '3', '4', '5', '6', '7', '8', '9'] Flag Meanings: ['metrics1', 'metrics2', 'metrics3', 'metrics4', 'metrics5', 'metrics6', 'metrics7', 'metrics8', 'metrics9']
ds_surf_type COMPACT	INTEGER (5)	Surface Type Dimension Scale	1	Dimension scale indexing the surface type array. Index=1 corresponds to Land; index = 2 corresponds to Ocean; Index = 3 corresponds to SeaIce; Index=4 corresponds to LandIce; Index=5 corresponds to InlandWater Flag Values: ['1', '2', '3', '4', '5'] Flag Meanings: ['land', 'ocean', 'seaice', 'landice', 'inland_water']
Group: /ancillary_data				
Description	(Attribute)	Contains information ancillary to the data product. This may include product characteristics, instrument characteristics and/or processing constants.		
data_rate	(Attribute)	Data within this group pertain to the granule in its entirety.		
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/land				
Description	(Attribute)	Constants used in the land_vegetation ATBD		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
atl08_region CHUNKED	INTEGER (:)	atl08 region atl08_region	1 Land ATBD 29March2019, Table 2.4	ATL08 region(s) encompassed by ATL03 granule being processed
bin_size_h COMPACT	FLOAT (1)	neighbor histogram bin size	1 ATBD (section 4.2.1 step 3)	Histogram bin size for the alternative DRAGANN algorithm. (Default = 1.0)
bin_size_n COMPACT	INTEGER (1)	neighbor histogram bin size	1 ATBD (section 4.2 step 4)	Size of neighbor histogram bins in number of neighbors in DRAGANN. (Default = 1)
bright_thresh COMPACT	FLOAT (1)	brightness flag average ph per	1 ATBD section 2.4.21	Threshold to set brightness_flag, average ground photons per shot. (Default = 3.0)

		shot		
ca_class COMPACT	INTEGER (1)	Canopy class value	1 ATBD section 4.12 step 1	Canopy classification flag value. (Default = 2)
can_noise_thresh COMPACT	INTEGER (1)	Threshold for reclassification of canopy as noise	1 ATBD section 4.11 step 6	Threshold, as a number of canopy photons in the CAN_FILT_SEG, used for the reclassification of canopy signal photons. (Default = 75)
can_stat_thresh COMPACT	FLOAT (1)	Threshold for canopy statistics	1 ATBD section 4.14.1 step 1	Minimum percentage of canopy photons to compute statistics upon. (Default =0.05)
canopy_flag_switch COMPACT	INTEGER (1)	canopy_flag switch	1 ATBD section 4.3	Controls entrance to the canopy flag subroutine . (Default = 1)
canopy_seg COMPACT	INTEGER (1)	segment size in canopy filter	1 ATBD section 4.11 step 6	Segment in number of signal photons for filtering sparse canopy cover. (Default = 500)
class_thresh COMPACT	INTEGER (1)	Threshold flag value for classification of photons as signal via input from ATL03	1 ATBD section 4.2 step 17	Threshold flag value for classification of photons as signal via input from ATL03. (Default =3)
cloud_filter_switch COMPACT	INTEGER (1)	cloud_filter switch	1 ATBD section 4.1.1	Controls entrance to the cloud_filter subroutine. (Default = 0)
del_amp COMPACT	FLOAT (1)	Step Gaussian Amplitude optimization	1 ATBD section 4.2 step 7	Step size for optimizing the amplitude variable of Gaussian function. (Default = 1.0)
del_mu COMPACT	FLOAT (1)	Step size for optimizing the mean parameter of Gaussian function.	1 ATBD section 4.2 step 7	Step size for optimizing the mean parameter of Gaussian function. (Default = 0.2)
del_sigma COMPACT	FLOAT (1)	Step size for optimizing the standard deviation parameter of Gaussian function.	1 ATBD section 4.2 step 7	Step size for optimizing the standard deviation parameter of Gaussian function. (Default = 0.5)
dem_filter_switch COMPACT	INTEGER (1)	dem_filter switch	1 ATBD section 4.5 step 5	Controls filtering based on DEM. (Default = 1)
dem_removal_percent_limit COMPACT	FLOAT (1)	dem_removal_flag set threshold	percent ATBD section 2.4.11	Percent of photons in land segment failing DEM test to set dem_removal_flag. (default = 20.0)
dragann_switch COMPACT	INTEGER (1)	DRAGANN switch	1 ATBD section 4.2	Controls entrance to the DRAGANN subroutine. (Default =1)
dseg COMPACT	INTEGER (1)	DRAGANN segment size	1 ATBD section 4.2.1 step 1	DRAGANN segment length in 20m geolocated segments along ground track. (Default=170)
dseg_buf COMPACT	INTEGER (1)	DRAGANN segment buffer size	1 ATBD section 4.2.1 step 1	DRAGANN segment buffer length in 20m geolocated segments along ground track. (Default=10)
fnlgnd_filter_switch COMPACT	INTEGER (1)	finalground filter switch	1 ATBD section 4.13 step 2	Controls filtering based on FINALGROUND. (Default = 1)
gnd_stat_thresh COMPACT	FLOAT (1)	Threshold for terrain statistics	1 ATBD section 4.13 step 2	Minimum percentage of terrain photons to compute statistics upon. (Default =0.05)
gthresh_factor COMPACT	FLOAT (1)	threshold for Gaussian	1 ATBD sGaussian	Controls threshold for Gaussian Elimination. (Default = 0.1)

		Elimination	Rejection section of Appendix A	
h_canopy_perc COMPACT	FLOAT (1)	h_canopy percentile	1 ATBD section 2.2.3	Percentile component of h_canopy parameter. (Default =0.95)
iter_gnd COMPACT	INTEGER (1)	Iterations of smoothing of interpolated ground surface for ground estimate.	1 ATBD section 4.10 step 1	Iterations of smoothing of interpolated ground surface for refinement. (Default = 10)
iter_max COMPACT	INTEGER (1)	Maximum number of iterations for optimizing the Gaussian parameters for fitting of histogram.	1 ATBD section 4.2 step 7	Maximum number of iterations for optimizing the Gaussian parameters for fitting of histogram. (Default = 10)
lseg COMPACT	INTEGER (1)	Long segment size	1 ATBD section 4.1 step 1	Long segment size in number of 20 meter segments along ground track. (Default=500)
lseg_buf COMPACT	INTEGER (1)	Long segment buffer size	1 ATBD section 4.1 step 2	Overlapping long segment buffer size in 20m geosegments along ground track. (Default=10)
lw_filt_bnd COMPACT	INTEGER (1)	Proportionality coefficient for controlling the bounds of the filter window size as a function of number of signal photons.	1 ATBD section 4.4 step 2	Lower bound of the filter window size function. (Default = 5)
lw_gnd_bnd COMPACT	FLOAT (1)	Lower bound restricting the search of a ground surface in canopy cases.	meters ATBD section 4.7 step 3	Lower bound restricting the search of a ground surface in canopy cases. (Default = -4.0)
lw_toc_bnd COMPACT	FLOAT (1)	Lower bound restricting the search of a top of canopy surface.	meters section 4.7 step 3 entered from section 4.8	Lower bound restricting the search of a top of canopy surface. (Default = -4.0)
lw_toc_cut COMPACT	FLOAT (1)	Lower cutoff for top of canopy	meters ATBD section 4.8 step 10	Lower cutoff for top of canopy surface. (Default = 2.0)
max_atl03files COMPACT	INTEGER (1)	Maximum number of input ATL03s	1 Operations	Maximum number of input ATL03 files. (Default = 200)
max_atl09files COMPACT	INTEGER (1)	Maximum number of input ATL09s	1 Operations	Maximum number of input ATL09 files. (Default = 200)
max_peaks COMPACT	INTEGER (1)	Maximum number of Gaussian peaks to fit in the data set	1 ATBD section 4.2 step 9	Maximum number of Gaussian peaks to fit in the data set in DRAGANN. (Default =10)
max_try COMPACT	INTEGER (1)	Maximum try count	1 ATBD section 4.2.1 step 17	Maximum number of tries to compute a P value in alternative DRAGANN
min_nphs COMPACT	INTEGER (1)	Minimum input photons	1 Operations	Minimum number of input photons from ATL03 to process. (default=1)
n_dec_mode COMPACT	INTEGER (1)	Mode decimal parameter	1 ATBD needed for section 4.13 step 3(h_te_mode)	Number of decimal places to consider in mode computation. (Default =1)

night_thresh COMPACT	FLOAT (1)	Threshold for night	1 ATBD section 2.4.9	Solar elevation threshold for determining night time conditions. (Default =0.0)
noise_class COMPACT	INTEGER (1)	Noise class value	1 ATBD section 4.12 step 1	Noise classification flag value. (Default = 0)
outlier_filter_switch COMPACT	INTEGER (1)	outlier_filter switch	1 ATBD section 4.6	Controls entrance to the outlier filter subroutine. (Default = 1)
p_static COMPACT	FLOAT (1)	Dragann Parameter	1 ATBD section 4.2 step 1	Parameter for controlling the search radius in nearest neighbor search in DRAGANN. (Default = 20)
ph_removal_percent_limit COMPACT	FLOAT (1)	ph_removal_flag set threshold	percent ATBD section 4.13 step 4	Percent of photons in land segment removed to set ph_removal_flag. (default = 50.0)
proc_geoseg COMPACT	INTEGER (1)	Geosegment process interval length	1 Operations	Geosegment process interval length. This controls the amount read from ATL03 and ATL09 at a time. (Default = 500000).
psf COMPACT	FLOAT (1)	Point Spread Function	meters ATBD section 4.7 step 12	Parameter controlling identification of photons around an interpolated surface. (Default = 0.5)
ref_dem_limit COMPACT	FLOAT (1)	DEM threshold	meters ATBD section 4.5 step 4	Reference DEM limit used to reclassify signal as noise. (default = 120.0)
ref_finalground_limit COMPACT	FLOAT (1)	finalground threshold	meters ATBD section 4.13 step 2	Reference finalground limit used to reclassify signal as noise. (default = 150.0)
relief_hbot COMPACT	FLOAT (1)	lower relief percentile	meters ATBD (section 4.5 step 6)	The approximate relief of the L-km segment uses the percentile height values, relief_htop and relief_hbot. (Default=0.05)
relief_htop COMPACT	FLOAT (1)	Upper relief percentile	meters ATBD (section 4.5 step 6)	The approximate relief of the L-km segment uses the percentile height values, relief_htop and relief_hbot. (Default=0.95)
shp_param COMPACT	FLOAT (1)	Exponential coefficient for controlling the exponential decay of the filter window size as a function of number of signal photons.	1 ATBD section 4.4 step 2	Exponential coefficient of the filter window size as a function. (Default = 21.0E-06)
sig_rsq_search COMPACT	FLOAT (1)	Square Radius of filter for canopy	meters^2 ATBD section 4.8 step 6	Top of canopy refinement square search radius. (Default = 225.0)
sseg COMPACT	FLOAT (1)	Short Segment Length	meters ATBD section 4.13 step 1	Short segment length in meters. (Default = 100.0)
stat_thresh COMPACT	INTEGER (1)	Threshold for land statistics	1 ATBD section 2 intro paragraph	Minimum number of photons to compute statistics upon. (Default =50)
tc_thresh COMPACT	FLOAT (1)	Canopy Flag threshold	1 ATBD section 4.3 steps 6 and 7	Percentage threshold for average L-km segment tree cover to be considered canopy. (Default = 5.0)
te_class COMPACT	INTEGER (1)	Terrain class value	1 ATBD section 4.12 step 1	Terrain classification flag value. (Default = 1)
toc_class COMPACT	INTEGER (1)	Top of canopy class value	1 ATBD section 4.12 step 1	Top of canopy classification flag value. (Default = 3)

up_filt_bnd COMPACT	INTEGER (1)	Proportionality coefficient for controlling the bounds of the filter window size as a function of number of signal photons.	1 ATBD section 4.4 step 2	Lower bound of the filter window size function. (Default = 46)
up_gnd_bnd COMPACT	FLOAT (1)	Upper bound restricting the search of a ground surface in canopy cases.	meters ATBD (section 4.7 step 3)	Upper bound restricting the search of a ground surface in canopy cases. (Default = 1.0)
up_toc_bnd COMPACT	FLOAT (1)	Upper bound restricting the search of a top of canopy surface.	meters ATBD section 4.7 step 3 entered from section 4.8	Upper bound restricting the search of a top of canopy surface. (Default=1.0)
up_toc_cut COMPACT	FLOAT (1)	upper cutoff of top of canopy surface.	meters ATBD section 4.8 step 10	Upper cutoff for top of canopy surface. (Default = 150.0)
Group: /gtx				
Description	(Attribute)	Each group contains the segments for one Ground Track. As ICESat-2 orbits the earth, sequential transmit pulses illuminate six ground tracks on the surface of the earth. The track width is approximately 14m. Each ground track is numbered, according to the laser spot number that generates a given ground track. Ground tracks are numbered from the left to the right in the direction of spacecraft travel as: 1L, 1R in the left-most pair of beams; 2L, 2R for the center pair of beams; and 3L, 3R for the right-most pair of beams.		
Group: /gtx/land_segments				
Description	(Attribute)	Contains data categorized as land at 100 meter intervals.		
data_rate	(Attribute)	Data are stored as aggregates of 100 meters.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
asr CHUNKED	FLOAT (:)	apparent surface reflectance	1 ATL09	Apparent surface reflectance
atlas_pa CHUNKED	FLOAT (:)	atlas pointing angle	radians ATL03	Off nadir pointing angle (in radians) of the satellite to increase spatial sampling in the non-polar regions. ATLAS_PA =90degs-beam_coelev.
beam_azimuth CHUNKED	FLOAT (:)	beam azimuth	radians ATL03	Azimuth(in radians) of the unit pointing vector for the reference photon in the local ENU frame in radians. The angle is measured from north and positive towards East.
beam_coelev CHUNKED	FLOAT (:)	beam co-elevation	radians ATL03	Co-elevation (CE) is direction from vertical of the laser beam as seen by an observer located at the laser ground spot.
brightness_flag CHUNKED	INTEGER_1 (:)	brightness flag	1 Land ATBD section 2.4.21	Flag indicating that the ground surface is bright (e.g. snow-covered or other bright surfaces) Flag Values: ['0', '1'] Flag Meanings: ['not_bright_surface', 'bright_surface']
cloud_flag_atm CHUNKED	INTEGER_1 (:)	cloud flag atm	1 ATL09	Cloud confidence flag from ATL09 that indicates the number of cloud or aerosol layers identified in each 25Hz atmospheric profile. If the flag is greater than 0, aerosols or clouds could be present. Valid range is 0 - 10.
cloud_fold_flag CHUNKED	INTEGER_1 (:)	cloud folding flag	ATL09	Flag that indicates this profile likely contains cloud signal folded down from above 15 km to the last 2-3 km of the profile. See ATL09 ATBD Table 3.9 for detailed flag value meanings. Flag Values: ['0', '1', '2', '3'] Flag Meanings: ['no_folding', 'goes5_indicates', 'profile_indicates', 'both_indicate']

delta_time CHUNKED	DOUBLE (:)	mean_pass_time time	seconds since 2018-01-01 Land ATBD section 2.4	Mean time for the segment in 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.
delta_time_beg CHUNKED	DOUBLE (:)	delta time begin	seconds since 2018-01-01 Derived (gps_seconds-gps_sec_offset)	Time of the first photon contained within the data segment, 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.
delta_time_end CHUNKED	DOUBLE (:)	delta time end	seconds since 2018-01-01 Derived (gps_seconds-gps_sec_offset)	Time of the last photon contained within the data segment, in 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.
dem_flag CHUNKED	INTEGER_1 (:)	dem source flag	1 Atmosphere ATBD	Indicates source of the DEM height. Values: 0=None, 1=Arctic, 2=GMTED, 3=MSS, 4=Antarctic. Flag Values: ['0', '1', '2', '3', '4'] Flag Meanings: ['none', 'arctic', 'gmted', 'mss', 'antarctic']
dem_h CHUNKED	FLOAT (:)	dem height	meters GIMP, GMTED,MSS	Best available DEM (in priority of Arctic/Antarctic/GMTED/MSS) value at the geolocation point. Height is in meters above the WGS84 Ellipsoid.
dem_removal_flag CHUNKED	INTEGER_1 (:)	dem removal flag	1 ATBD section 2.4.11	Flag indicating more than dem_removal_percent_limit (default 20.0) removed from land segment due to failing DEM-QA tests Flag Values: ['0', '1'] Flag Meanings: ['below_threshold', 'above_threshold']
h_dif_ref CHUNKED	FLOAT (:)	h dif from reference	meters Land ATBD section 2.4	Difference between h_te_median and ref_DEM
last_seg_extend CHUNKED	FLOAT (:)	last segment extended last_seg_extend	kilometers Land ATBD 13March2019, Section 2.4.20	The distance (km) that the last ATL08 processing segment in a file is either extended or overlapped with the previous ATL08 processing segment.
latitude CHUNKED	FLOAT (:)	latitude latitude	degrees Land ATBD section 2.4	Latitude of the center-most signal photon within each segment.
layer_flag CHUNKED	INTEGER_1 (:)	consolidated cloud flag	ATL09	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']
longitude CHUNKED	FLOAT (:)	longitude longitude	degrees Land ATBD section 2.4	Longitude of the center-most signal photon within each segment.

msw_flag CHUNKED	INTEGER_1 (:)	multiple scattering warning flag	1 ATL09	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_seg_ph CHUNKED	INTEGER (:)	number of photons	1 Derived	Number of photons within each land segment.
night_flag CHUNKED	INTEGER (:)	night flag	1 Land ATBD section 2.4.8	Flag indicating the data were acquired in night conditions: 0=day, 1=night. Flag is derived from solar elevation at the geolocated segment. IF solar elevation is above threshold it is day, if not then it is night. Threshold is set in atlas_l3a_const_mod. Flag Values: ['0', '1'] Flag Meanings: ['day', 'night']
ph_ndx_beg CHUNKED	INTEGER_8 (:)	photon index begin	1 Derived	Index (1-based) within the photon-rate data (/land_segments/photons) of the first photon within this each land segment.
ph_removal_flag CHUNKED	INTEGER_1 (:)	ph removal flag	1 ATBD section 4.13	Flag indicating more than ph_removal_percent_limit (default 50.0) removed from land segment due to failing QA tests Flag Values: ['0', '1'] Flag Meanings: ['below_threshold', 'above_threshold']
psf_flag CHUNKED	INTEGER_1 (:)	point spread function flag	1 Land/Veg ATBD	Flag is set to 1 if the point spread function (computed as sigma_atlas_land) has exceeded the threshold (1 m) Flag Values: ['0', '1'] Flag Meanings: ['below_threshold', 'above_threshold']
rgt CHUNKED	INTEGER_2 (:)	reference ground track	1 Operations	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.
segment_id_beg CHUNKED	INTEGER (:)	begin geolocation segment bin	1 ATL03	Geolocation segment number of the first photon in the land segment.
segment_id_end CHUNKED	INTEGER (:)	end geolocation segment bin	1 ATL03	Geolocation segment number of the last photon in the land segment.
segment_landcover CHUNKED	INTEGER (:)	segment landcover	1 ATBD section 2.4.14	IGBP Land Cover Surface type classification as reference from MODIS Land Cover(ANC18) at the 0.5 arcsecond resolution. Flag Values: ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16'] Flag Meanings: ['Water', 'Evergreen_Needleleaf_Forest', 'Evergreen_Broadleaf_Forest', 'Deciduous_Needleleaf_Forest',

				'Deciduous_Broadleaf_Forest', 'Mixed_Forest', 'Closed_Shrublands', 'Open_Shrubland', 'Woody_Savanna', 'Savanna', 'Grassland', 'Wetland', 'Croplands', 'Urban', 'Crop_Mosaic', 'Permanent_Snow', 'Barren']
segment_snowcover CHUNKED	INTEGER_1 (:)	segment snowcover	1 ATBD section 4.2.16	Daily snow/ice cover from ATL09 at the 25 Hz rate(275m) indicating likely presence of snow and ice within each segment. 0=ice free water; 1=snow free land; 2=snow; 3=ice. Flag Values: ['0', '1', '2', '3'] Flag Meanings: ['ice_free_water', 'snow_free_land', 'snow', 'ice']
segment_watermask CHUNKED	INTEGER (:)	segment watermask	1 ATBD section 2.4.15	Water mask(i.e. flag) indicating inland water as referenced from the Global Raster Water Mask(ANC33) at 250 m spatial resolution. Flag Values: ['0', '1'] Flag Meanings: ['no_water', 'water']
sigma_across CHUNKED	FLOAT (:)	sigma atlas y	1 ATL03	Total cross-track uncertainty due to PPD and POD knowledge. Read from ATL03 product gtx/geolocation/sigma_across. Sigma_atlas_y is reported on ATL08 as the uncertainty of the center-most reference photon of the 100m ATL08 segment.
sigma_along CHUNKED	FLOAT (:)	sigma atlas x	1 ATL03	Total along-track uncertainty due to PPD and POD knowledge. Read from ATL03 product gtx/geolocation/sigma_along. Sigma_atlas_x is reported on ATL08 as the uncertainty of the center-most reference photon of the 100m ATL08 segment.
sigma_atlas_land CHUNKED	FLOAT (:)	sigma atlas land	1 Land ATBD section 2.5.13	Total vertical geolocation error due to ranging and local surface slope. The parameter is computed for ATL08 as described in equation 1.2.
sigma_h CHUNKED	FLOAT (:)	height uncertainty	1 ATL03	Estimated uncertainty for the reference photon bounce point ellipsoid height: 1- sigma (m) provided at the geolocation segment rate on ATL03. Sigma_h is reported on ATL08 as the uncertainty of the center-most reference photon of the 100m ATL08 segment.
sigma_topo CHUNKED	FLOAT (:)	sigma atlas topo	1 Land ATBD section 2.5.12	Total uncertainty that include sigma_h plus geolocation uncertainty due to local slope (equation 1.3). The local slope is multiplied by the geolocation uncertainty factor. This will be used to determine the total vertical geolocation error due to ranging and local slope.
snr CHUNKED	FLOAT (:)	signal to noise ratio	1 ATBD section 2.5.14	The signal to noise ratio of geolocated photons as determined by the ratio of the superset of ATL03 signal and DRAGANN found signal photons used for processing the ATL08 segments to the background photons (i.e. noise) within the same ATL08 segments.
solar_azimuth CHUNKED	FLOAT (:)	solar azimuth	degrees_east ATL03g 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 ATL03g 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.
surf_type CHUNKED	INTEGER_1 (: x 5)	surface type	1 ATL03 ATBD, Section 4	Flags describing which surface types this interval is associated with. 0=not type, 1=is type. Order of array is land, ocean, sea ice, land ice, inland water. Flag Values: ['0', '1'] Flag Meanings: ['not_type', 'is_type']
terrain_flg CHUNKED	INTEGER (:)	terrain flag	1 Land ATBD section	Terrain flag quality check to indicate a deviation above a threshold from the reference DEM height reported on the

			2.4.8	product. Flag Values: ['0', '1'] Flag Meanings: ['below_threshold', 'above_threshold']
urban_flag CHUNKED	INTEGER (:)	segment urban flag	1 Land ATBD section 2.4.17	The urban flag indicates that a segment is likely located over an urban area. Flag Values: ['0', '1'] Flag Meanings: ['not_urban', 'urban']
Group: /gtx/land_segments/canopy				
Description	(Attribute)	Contains height parameters based on the land algorithm.		
data_rate	(Attribute)	Data are stored as aggregates of 100 meters.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
canopy_flag CHUNKED	INTEGER (:)	canopy flag	1 Land ATBD section 2.2.22	Flag indicating that canopy was detected using the Landsat Tree Cover Continuous Fields data product. If percent of canopy cover along the L-km segment is greater than 5%, then canopy is assumed to be present; else, no canopy is assumed present. Flag Values: ['0', '1'] Flag Meanings: ['no_canopy_present', 'canopy_present']
canopy_h_metrics CHUNKED	FLOAT (: x 9)	canopy height metrics	meters Land ATBD section 2.2.3	Height metrics based on the cumulative distribution of relative canopy heights above the interpolated ground surface. The height metrics are calculated at the following percentiles: 25,50,60,70,75,80,85,90,95%.
canopy_h_metrics_abs CHUNKED	FLOAT (: x 9)	canopy absolute height metrics	meters Land ATBD section 2.2.3	Height metrics based on the cumulative distribution of absolute canopy heights above the WGS84 Ellipsoid. The height metrics are calculated at the following percentiles: 25,50,60,70,75,80,85,90,95%.
canopy_openness CHUNKED	FLOAT (:)	canopy openness	1 Land ATBD section 4.12	Standard Deviation of all photons classified as canopy photons within the segment to provide inference of canopy openness.
canopy_rh_conf CHUNKED	INTEGER_1 (:)	canopy relative height confidence	1 Land/Veg ATBD 13March2019, Section 2.2.21	Canopy relative height confidence flag based on percentage of ground and canopy photons within a segment: 0 (<5% canopy), 1 (>5% canopy, <5% ground), 2 (>5% canopy, >5% ground). Flag Values: ['0', '1', '2'] Flag Meanings: ['<5%_canopy', '>=5%_canopy_<5%_ground', '>=5%_canopy_>=5%_ground']
centroid_height CHUNKED	FLOAT (:)	centroid height	meters Land ATBD section 2.2.22	Optical centroid of all photons classified as either canopy or ground points within the segment. The heights used in this calculation are absolute heights above the reference ellipsoid. This parameter is equivalent to the centroid height produced ICESat GLA14.
h_canopy CHUNKED	FLOAT (:)	height canopy	meters Land ATBD section 4.12	98% height of all the individual canopy relative heights for the segment above the estimated terrain surface. Relative canopy heights have been computed by differencing the canopy photon height from the estimated terrain surface.
h_canopy_abs CHUNKED	FLOAT (:)	absolute segment canopy height	meters Land ATBD section 2.2.2	The 98% height of all the absolute individual canopy heights referenced above the WGS84 ellipsoid.
h_canopy_quad CHUNKED	FLOAT (:)	canopy quadratic mean	meters Land ATBD section 4.12	The quadratic mean height of individual classified relative canopy photon heights above the estimated terrain surface.
h_canopy_uncertainty CHUNKED	FLOAT (:)	segment canopy height uncertainty	meters Land ATBD section	Uncertainty of the relative canopy heights for the segment. Incorporates all systematic uncertainties as well as

			1.5	uncertainty from errors of identified photons. See section 1 and equations 1.4 and 1.5 in the Land ATBD
h_dif_canopy CHUNKED	FLOAT (:)	canopy diff to median height	meters Land ATBD section 4.12	Difference between h_canopy and h_median_canopy
h_max_canopy CHUNKED	FLOAT (:)	maximum canopy height	meters Land ATBD section 2.2.12	Relative maximum of individual canopy heights within segment. Relative canopy heights have been computed by differencing the canopy photon height from the estimated terrain surface. Should be equivalent to RH100 metric reported in the literature.
h_max_canopy_abs CHUNKED	FLOAT (:)	absolute maximum canopy height	meters Land ATBD section 2.2.11	Maximum of individual absolute canopy heights within segment referenced above the WGS84 ellipsoid.
h_mean_canopy CHUNKED	FLOAT (:)	mean canopy height	meters Land ATBD section 4.12	Mean of individual relative canopy heights within segment. Relative canopy heights have been computed by differencing the canopy photon height from the estimated terrain surface.
h_mean_canopy_abs CHUNKED	FLOAT (:)	absolute mean canopy height	meters Land ATBD section 2.2.4	Mean of the individual absolute canopy heights within segment referenced above the WGS84 Ellipsoid.
h_median_canopy CHUNKED	FLOAT (:)	median canopy height	meters Land ATBD section 2.2.8	The median of individual relative canopy heights within segment. Relative canopy heights have been computed by differencing the canopy photon height from the estimated terrain surface. This parameter should be equivalent to RH50 reported in the literature.
h_median_canopy_abs CHUNKED	FLOAT (:)	absolute segment median canopy height	meters Land ATBD section 2.2.6	The median of individual absolute canopy heights within segment referenced above the WGS84 Ellipsoid.
h_min_canopy CHUNKED	FLOAT (:)	minimum canopy height	meters Land ATBD section 2.2.10	The minimum of relative individual canopy heights within segment. Relative canopy heights have been computed by differencing the canopy photon height from the estimated terrain surface.
h_min_canopy_abs CHUNKED	FLOAT (:)	absolute minimum canopy height	meters Land ATBD section 2.2.9	The minimum of absolute individual canopy heights within segment referenced above the WGS84 Ellipsoid.
landsat_flag CHUNKED	INTEGER (:)	landsat flag	1 Land ATBD section 2.2.25	Flag indicating that more than 50% of the Landsat Continuous Cover product have values > 100 for the L-Km segment. Canopy is assumed present along the L-km segment if landsat_flag is 1. Flag Values: ['0', '1'] Flag Meanings: ['canopy_not_assumed_present', 'canopy_assumed_present']
landsat_perc CHUNKED	FLOAT (:)	landsat percentage canopy	1 Land ATBD section 2.2.24	Average percentage value of the valid (value <= 100) Landsat Tree Cover Continuous Fields product for each 100 m segment
n_ca_photons CHUNKED	INTEGER (:)	number canopy photons	1 Land ATBD section 4.12	The number of photons classified as canopy within the segment.
n_toc_photons CHUNKED	INTEGER (:)	number top of canopy photons	1 Land ATBD section 4.12	The number of photons classified as top of canopy within the segment.
subset_can_flag CHUNKED	INTEGER_1 (: x 5)	subset canopy flag	1 Land/Veg ATBD 15 Novemebr 2019, Section 2.2.25	Quality flag indicating the canopy photons populating the 100 m segment statistics are derived from less than 100 m worth of photons and/or less than 5 20m ATL03 segments. Flag Values: ['-1', '0', '1'] Flag Meanings: ['no_photon_data_within_geosegment', 'no_canopy_photons_within_geosegment', 'canopy_photons_present_within_geosegment']

toc_roughness CHUNKED	FLOAT (:)	top of canopy roughness	meters Land ATBD section 4.12	Standard deviation of the relative heights of all photons classified as top of canopy within the segment
Group: /gtx/land_segments/terrain				
Description	(Attribute)	Contains terrain parameters at a 100m aggregation.		
data_rate	(Attribute)	Data are stored as aggregates of 100 meters.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
h_te_best_fit CHUNKED	FLOAT (:)	segment terrain height best fit	meters Land ATBD section 2.1.15	The best fit terrain elevation at the the mid-point location of each 100m segment. The mid-segment terrain elevation is determined by selecting the best of three fits- linear, 3rd order and 4th order polynomials - to the terrain photons and interpolating the elevation at the mid-point location of the 100 m segment. For the linear fit, a slope correction and weighting is applied to each ground photon based on the distance to the slope height at the center of the segment.
h_te_interp CHUNKED	FLOAT (:)	interpolated terrain surface height	meters Land ATBD section 4.9	Interpolated terrain surface height above the WGS84 Ellipsoid at the midpoint of the segment.
h_te_max CHUNKED	FLOAT (:)	maximum terrain height	meters Land ATBD section 4.11	The maximum of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_mean CHUNKED	FLOAT (:)	mean terrain height	meters Land ATBD section 4.11	The mean of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_median CHUNKED	FLOAT (:)	median terrain height	meters Land ATBD section 4.11	The median of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_min CHUNKED	FLOAT (:)	minimum terrain height	meters Land ATBD section 4.11	The minimum of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_mode CHUNKED	FLOAT (:)	mode of terrain heights	meters Land ATBD section 4.11	The mode of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_skew CHUNKED	FLOAT (:)	skew of terrain heights	meters Land ATBD section 4.11	The skewness of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_std CHUNKED	FLOAT (:)	segment terrain roughness	meters Land ATBD section 4.11	The standard deviation of the photon heights above the WGS84 Ellipsoid, classified as terrain within the segment.
h_te_uncertainty CHUNKED	FLOAT (:)	uncertainty of h_te_mean	meters Land ATBD section 4.11	Uncertainty of the mean terrain height for the segment. This uncertainty incorporates all systematic uncertainties(e.g. timing orbits, geolocation,etc.) as well as uncertainty from errors of identified photons. This parameter is described in section 1, equation 1.4
n_te_photons CHUNKED	INTEGER (:)	number of ground photons	1 Land ATBD section 4.11	The number of the photons classified as terrain within the segment.
subset_te_flag CHUNKED	INTEGER_1 (: x 5)	subset terrain flag	1 Land/Veg ATBD 15 Novemebr 2019, Section 2.1.15	Quality flag indicating the terrain photons populating the 100 m segment statistics are derived from less than 100 m worth of photons and/or less than 5 20m ATL03 segments. Flag Values: ['-1', '0', '1'] Flag Meanings: ['no_photon_data_within_geosegment', 'no_terrain_photons_within_geosegment', 'terrain_photons_present_within_geosegment']
terrain_slope CHUNKED	FLOAT (:)	segment terrain slope	1 Land ATBD section	The along-track slope of terrain, within each segment;computed by a linear fit of terrain classified

			4.11	photons. Slope is in units of delta height over delta along track distance.
Group: /gtx/signal_photons				
Description	(Attribute)	Contains parameters related to individual photons.		
data_rate	(Attribute)	Data are stored at the signal-photon classification rate.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
classed_pc_flag CHUNKED	INTEGER_1 (:)	photon land atbd classification	1 Land ATBD section 4.10	Land Vegetation ATBD classification flag for each photon as either noise, ground, canopy, and top of canopy. 0 = noise, 1 = ground, 2 = canopy, or 3 = top of canopy. Flag Values: ['0', '1', '2', '3'] Flag Meanings: ['noise', 'ground', 'canopy', 'top_of_canopy']
classed_pc_indx CHUNKED	INTEGER (:)	indicies of classed photons	1 Retained from prior a_alt_science_ph packet	Index (1-based) of the ATL08 classified signal photon from the start of the ATL03 geolocation segment specified on the ATL08 product at the photon rate in the corresponding parameter, ph_segment_id. This index traces back to specific photon within a 20m segment_id on ATL03. The unique identifier for tracing each ATL08 signal photon to the corresponding photon record on ATL03 is the segment_id, orbit, cycle, and classed_pc_indx. Orbit and cycle intervals for the granule are found in the /ancillary_data. The timestamp of each orbit transition is found in the /orbit_info group.
d_flag CHUNKED	INTEGER_1 (:)	dragann flag	1 Land ATBD section 2.3.5	Flag indicating the labeling of DRAGANN noise filtering for a given photon. Flag Values: ['0', '1'] Flag Meanings: ['noise', 'signal']
delta_time CHUNKED	DOUBLE (:)	delta time time	seconds since 2018-01-01 ATL03	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.
ph_segment_id CHUNKED	INTEGER (:)	segment id of photon	1 Retained from prior a_alt_science_ph packet	Segment ID of photons tracing back to specific 20m segment_id on ATL03. The unique identifier for tracing each ATL08 signal photon to the photon on ATL03 is the segment_id, orbit, and classed_pc_indx. The unique identifier for tracing each ATL08 signal photon to the corresponding photon record on ATL03 is the segment_id, orbit, cycle, and classed_pc_indx. Orbit and cycle intervals for the granule are found in the /ancillary_data. The timestamp of each orbit transition is found in the /orbit_info group.
Group: /orbit_info				
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']