ATL03 Product Data Dictionary

Date Generated : 2020-10-21T15:56:53

description	(Attribute)	This data set (ATL03) contains height above the WGS 84 ellipsoid (ITRF2014 reference frame), latitude, longitude, and time for all photons downlinked by the Advanced Topographic Laser Altimeter System (ATLAS) instrument on board the Ice, Cloud and land Elevation Satellite-2 (ICESat-2).
level	(Attribute)	L2
short_name	(Attribute)	ATL03
title	(Attribute)	SET_BY_META
Group: /		This data set (ATL03) contains height above the WGS 84 ellipsoid (ITRF2014 reference frame), latitude, longitude, and time for all photons downlinked by the Advanced Topographic Laser Altimeter System (ATLAS) instrument on board the Ice, Cloud and land Elevation Satellite-2 (ICESat-2).
Conventions	(Attribute)	CF-1.6
citation	(Attribute)	Copied from ESDT MD_Constraints/useLimitation
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)	Copied from ESDT CI_ResponsibleParty/organisationName/originator
date_created	(Attribute)	SET_BY_PGE
date_type	(Attribute)	UTC
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)	ATL03
hdfversion	(Attribute)	SET_BY_PGE
history	(Attribute)	SET_BY_PGE
identifier_file_uuid	(Attribute)	SET_BY_PGE
identifier_product_doi	(Attribute)	Copied from ESDT MD_Identifier/code/Anchor
identifier_product_doi_authority	(Attribute)	http://dx.doi.org
identifier_product_format_version	(Attribute)	SET_BY_PGE
identifier_product_type	(Attribute)	ATL03
institution	(Attribute)	Copied from ESDT CI_ResponsibleParty/organisationName
instrument	(Attribute)	Copied from ESDT EOS_Instrument/citation/CI_Citation/title
keywords	(Attribute)	Copied from ESDT MD_Keywords/keyword
keywords_vocabulary	(Attribute)	Copied from ESDT MD_Keywords/thesaurusName/CI_Citation/title
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)	Copied from ESDT EOS_Platform/citation/CI_Citation/title
processing_level	(Attribute)	Copied from ESDT processingLevel/MD_Identifier

project	(Attribute)	Copied from ESDT MI_Operation/citation/CI_Citation/title		
publisher_email	(Attribute)	Copied from ESDT CI_Address/electronicMailAddress		
publisher_name	(Attribute)	Copied from ESDT contact/CI_ResponsibleParty/organisationName		
publisher_url	(Attribute)	Copied from ESDT CI_OnlineResource/linkage		
references	(Attribute)	Copied from ESDT CI_OnlineResource/linkage		
source	(Attribute)	Copied from ESDT EOS_Platform/description		
spatial_coverage_type	(Attribute)	Horizontal		
standard_name_vocabulary	(Attribute)	CF-1.6		
summary	(Attribute)	Copied from ESDT identificationInfo/MD_DataIdentification/purpose		
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		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
ds_surf_type COMPACT	INTEGER([5])	Surface Type Dimension Scale None	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 (Source: dim_scale); (Meanings: [1 2 3 4 5]) (Values: ['land' 'ocean' 'seaice' 'landice' 'inland_water'])
ds_xyz COMPACT	INTEGER([3])	XYZ Dimension Scale None	1	Dimension scale indexing the XYZ components of velocity_sc. Index=1 corresponds to X; index = 2 corresponds to Y; Index = 3 corresponds to Z; (Source: dim_scale); (Meanings: [1 2 3]) (Values: ['x' 'y' 'z'])
Group: /ancillary_data		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(Dims) Fillvalue	long_name standard_name	units	description
atlas_sdp_gps_epoch COMPACT	DOUBLE([1])	ATLAS Epoch Offset None	seconds since 1980-01-06T00:00:00.000000Z	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. (Source: Operations)
control CONTIGUOUS	STRING([1])	Control File None	1	PGE-specific control file used to generate this granule. To re-use, replace breaks (BR) with linefeeds. (Source: Operations)
data_end_utc COMPACT	STRING([1])	End UTC Time of Granule (CCSDS-A, Actual) None	1	UTC (in CCSDS-A format) of the last data point within the granule. (Source: Derived)
data_start_utc COMPACT	STRING([1])	Start UTC Time of Granule (CCSDS-A, Actual) None	1	UTC (in CCSDS-A format) of the first data point within the granule. (Source: Derived)
end_cycle COMPACT	INTEGER([1])	Ending Cycle None	1	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. (Source: Derived)
end_delta_time COMPACT	DOUBLE([1])	ATLAS End Time (Actual) time	seconds since 2018-01-01	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. (Source: Derived)
end_geoseg COMPACT	INTEGER([1])	Ending Geolocation Segment None	1	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. (Source: Derived)
end_gpssow COMPACT	DOUBLE([1])	Ending GPS SOW of Granule (Actual) None	seconds	GPS seconds-of-week of the last data point in the granule. (Source: Derived)
end_gpsweek COMPACT	INTEGER([1])	Ending GPSWeek of Granule (Actual) None	weeks from 1980-01-06	GPS week number of the last data point in the granule. (Source: Derived)
end_orbit COMPACT	INTEGER([1])	Ending Orbit Number None	1	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. (Source: Derived)
end_region COMPACT	INTEGER([1])	Ending Region None	1	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. (Source: Derived)

end_rgt COMPACT	INTEGER([1])	Ending Reference Groundtrack None	1	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. (Source: Derived)
granule_end_utc COMPACT	STRING([1])	End UTC Time of Granule (CCSDS-A, Requested) None	1	Requested end time (in UTC CCSDS-A) of this granule. (Source: Derived)
granule_start_utc COMPACT	STRING([1])	Start UTC Time of Granule (CCSDS-A, Requested) None	1	Requested start time (in UTC CCSDS-A) of this granule. (Source: Derived)
release COMPACT	STRING([1])	Release Number None	1	Release number of the granule. The release number is incremented when the software or ancillary data used to create the granule has been changed. (Source: Operations)
start_cycle COMPACT	INTEGER([1])	Starting Cycle None	1	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. (Source: Derived)
start_delta_time COMPACT	DOUBLE([1])	ATLAS Start Time (Actual) time	seconds since 2018-01-01	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. (Source: Derived)
start_geoseg COMPACT	INTEGER([1])	Starting Geolocation Segment None	1	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. (Source: Derived)
start_gpssow	DOUBLE([1])	Start GPS SOW of Granule	seconds	GPS seconds-of-week of the first

COMPACT		(Actual) None		data point in the granule. (Source: Derived)
start_gpsweek COMPACT	INTEGER([1])	Start GPSWeek of Granule (Actual) None	weeks from 1980-01-06	GPS week number of the first data point in the granule. (Source: Derived)
start_orbit COMPACT	INTEGER([1])	Starting Orbit Number None	1	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. (Source: Derived)
start_region COMPACT	INTEGER([1])	Starting Region None	1	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. (Source: Derived)
start_rgt COMPACT	INTEGER([1])	Starting Reference Groundtrack None	1	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. (Source: Derived)
version COMPACT	STRING([1])	Version None	1	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. (Source: Operations)
Group: /ancillary_data/altimetry		Constants used in altimetry processing.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
atl03_pad COMPACT	DOUBLE([1])	Padding for ATL03 processing None	seconds	Seconds of padding data needed for ATL03 processing. (Source: Control)
band_tol COMPACT	FLOAT([1])	Tolerance for band-to-DEM comparison None	meters	The tolerance, in meters, used to identify telemetry bands that do no intersect the DEM. (Source: Control)
min_full_sat COMPACT	INTEGER([2])	Min Full Saturation Photons None	1	The minimum number of photons within a single transmit pulse that determines the pulse is fully saturated. (strong, weak) (Source: Control)
min_near_sat COMPACT	INTEGER([2])	Min Near Saturation Photons None	1	The minimum number of photons within a single transmit pulse that determines the pulse is nearly saturated. (strong, weak) (Source: Control)
min_sat_h COMPACT	FLOAT([1])	Minimum saturation height None	meters	The height, in meters, used for determining a saturated transmit pulse. (Source: Control)

ph_sat_flag COMPACT	INTEGER_1([1])	Saturation identification flag None	1	Indicates if identification of possibly saturated photons (using ph_quality) is enabled. (0=disabled, 1=enabled) (Source: Control); (Meanings: [0 1]) (Values: ['disabled' 'enabled'])
ph_sat_lb COMPACT	FLOAT([1])	Saturation identification lower bound None	meters	Lower bound of window used in saturation identification. (Source: Control)
ph_sat_ub COMPACT	FLOAT([1])	Saturation identification upper bound None	meters	Upper bound of window used in saturation identification. (Source: Control)
podppd_pad COMPACT	DOUBLE([1])	Padding for POD/PPD Interpolation None	seconds	Seconds of padding data needed for POD/PPD interpolation. (Source: Control)
Group: /ancillary_data/atlas_engineering		This group contains statistics for ATLAS engineering data.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
det_ab_flag COMPACT	INTEGER([1])	Detector Side, A or B None	1	Indicates if the active detector (DET) is side A (1) or side B (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])
ds_gt CONTIGUOUS	INTEGER_1([6])	GT Index None	1	Dimension scale for ATLAS Groundtracks (gt1l, gt1r, gt2l, gt2r, gt3l, gt3r) (Source: dim_scale); (Meanings: [1 2 3 4 5 6]) (Values: ['gt1l' 'gt1r' 'gt2l' 'gt2r' 'gt3l' 'gt3r'])
ds_stat CONTIGUOUS	INTEGER_1([4])	Stat Index None	1	Dimension scale for statistics in the order mean, sdev, min, max (Source: dim_scale); (Meanings: [1 2 3 4]) (Values: ['mean' 'sdev' 'min' 'max'])
hvpc_ab_flag COMPACT	INTEGER([1])	HVPC Side, A or B None	1	Indicates if the active High Voltage Power Converter (HVPC) is side A (1) or side B (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])
laser_12_flag COMPACT	INTEGER([1])	Laser 1 or Laser 2 None	1	Indicates if the active Laser is laser 1 or laser 2. (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['1' '2'])
lrs_ab_flag COMPACT	INTEGER([1])	LRS Side A or B None	1	Indicates if the active LRS is side A (1) or side B (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])
pdu_ab_flag COMPACT	INTEGER([1])	PDU Side A or B None	1	Indicates if the active PDU is side a (1) or side b (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])
ph_uncorrelated_error COMPACT	FLOAT([6, 1])	Uncorrelated Error None	meters	The estimate of uncorrelated height error. This is a six-valued array mapped onto gt1l, gt1r, gt2l, gt2r, gt3l, gt3r using the sc_orient parameter. (Source: ATL03 ATBD, Section 7.7.2)
spd_ab_flag COMPACT	INTEGER([1])	SPD A or B None	1	Indicates if the active Start Pulse Detector (SPD) is side a (1) or side b (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])
tams_ab_flag COMPACT	INTEGER([1])	TAMS Side A or B None	1	Indicates if the active TAMS is side a (1) or side b (2). (Source: Derived, L1B ATBD); (Meanings: [1 2]) (Values: ['a' 'b'])

Group: /ancillary_data/atlas_engineering/receiver		This group contains receiver parameters.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
rx_bckgrd_sensitivity COMPACT	FLOAT([6, 4]) 	Receiver background sensivitiy None	events/joule	Per-beam receiver background sensitivity. This is a six-valued array mapped onto gt1l, gt1r, gt2l, gt2r, gt3l, gt3r using the sc_orient parameter. (Source: ATL02 ATBD, Sections 5.3.2)
rx_return_sensitivity COMPACT	FLOAT([6, 4]) 	Receiver return sensitivity None	events/joule	Per-beam receiver return sensitivity. This is a six-valued array mapped onto gt1l, gt1r, gt2l, gt2r, gt3l, gt3r using the sc_orient parameter. (Source: ATL02 ATBD, Sections 5.3.2)
Group: /ancillary_data/atlas_engineering/transmit		This group contains transmit parameters.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
tx_pulse_distribution COMPACT	FLOAT([6, 1]) 	transmit pulse energy distribution None	1	The fraction of the transmit pulse energy in a given beam, based on pre-launch calibration. This is a six-valued array mapped onto gt1l, gt1r, gt2l, gt2r, gt3l, gt3r using the sc_orient parameter. (Source: ATL03 ATBD, Section 7.2)
tx_pulse_energy COMPACT	FLOAT([6, 4]) 	ATLAS Transmit Energy None	joules	The mean, standard deviation, minimum and maximum values of the transmit energy for each beam as reported by the start pulse detector, averaged over a given ATL03 granule. This is a 6x4 array mapped onto gt1l, gt1r, gt2l, gt2r, gt3l, gt3r using the sc_orient parameter. (Source: ATL03 ATBD Section 7.2.1)
tx_pulse_skew_est COMPACT	FLOAT([1, 4]) 	transmit pulse shape skew None	seconds	The difference between the means of the lower and upper threshold crossing times; a positive value corresponds to a positive skew in the pulse, and conversely for a negative value. (Source: ATL02, described in ATL03 ATBD Section 7.2.1)
tx_pulse_thresh_lower COMPACT	FLOAT([1, 4]) 	transmit pulse lower threshold None	volts	The lower threshold setting of the start pulse detector. The threshold crossing times are used to determine the start pulse time, and estimate the start pulse shape. If this setting changes during a given granule, this parameter becomes two-valued. (Source: ATL03 ATBD, Section 7.2)
tx_pulse_thresh_upper COMPACT	FLOAT([1, 4]) 	transmit pulse upper threshold None	volts	The upper threshold setting of the start pulse detector. The threshold crossing times are used to determine the start pulse time, and estimate the start pulse shape. If this setting changes during a given granule, this parameter becomes two-valued. (Source: ATL03 ATBD, Section 7.2)
tx_pulse_width_lower COMPACT	FLOAT([1, 4]) 	lower threshold crossing time difference None	seconds	The difference between the two crossing times of the transmit pulse (Source: ATL02, described in ATL03 ATBD Section 7.2.1)
tx_pulse_width_upper COMPACT	FLOAT([1, 4]) 	upper threshold crossing time difference None	seconds	The difference between the two crossing times of the transmit pulse (Source: ATL02, described in ATL03

				ATBD Section 7.2.1)
Group: /ancillary_data/calibrations		This group contains calibrations derived from the ATLAS CAL products.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
ds_channel CONTIGUOUS	INTEGER_1([20])	Channel None	1	Dimension scale for ATLAS PCE channels (1-16=strong, 17-20=weak) (Source: dim_scale)
Group: /ancillary_data/calibrations/dead_time		CAL42 - Dead-time. Estimates dead time for each ATLAS receiver channel accompanied by an estimated standard deviation for that measurement. photoelectrons/spot/shot, channel-to-channel basis.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
cal42_product COMPACT	STRING([1])	CAL Product Name None	1	Name of ATLAS CAL Product containing the calibration data (Source: CAL42)
side COMPACT	INTEGER([1])	Detector Bank Side None	1	A or B side of the detector bank (Source: CAL42); (Meanings: [1 2]) (Values: ['A' 'B'])
temperature COMPACT	FLOAT([1])	Temperature None	degreesC	Temperature for which calibrations are provided. (Source: CAL42)
Group: /ancillary_data/calibrations/dead_time/gtx		CAL42 - Dead-time. Estimates dead time for each ATLAS receiver channel accompanied by an estimated standard deviation for that measurement. photoelectrons/spot/shot, channel-to-channel basis.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
dead_time COMPACT	DOUBLE([20])	DeadTime None	seconds	Dead Time (per ATLAS PCE channel; 1-16=strong, 17-20=weak) (Source: CAL42)
sigma COMPACT	DOUBLE([20])	Sigma None	seconds	Sigma (per ATLAS PCE channel; 1-16=strong, 17-20=weak) (Source: CAL42)
Group: /ancillary_data/calibrations/dead_time_radiometric_signal_loss		CAL34 - Dead-time Radiometric Signal Loss. Contains a table of radiometric corrections versus apparent return strength and width for several dead-time values. Correction is to be multiplied by raw return strength to get corrected return strength		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
cal34_product CHUNKED	STRING(['Unlimited'])	CAL Product Name None	1	Name of ATLAS CAL Products containing the calibration data (Source: CAL34)
Group: /ancillary_data/calibrations/dead_time_radiometric_signal_loss/gtx		CAL34 - Dead-time Radiometric Signal Loss. Provides a measure of counting efficiency loss as function of first photon bias for received photoelectron populations via combinations of return signal pulsewidth & mean photoelectrons/spot/shot, channel-to-channel basis.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
dead_time CHUNKED	FLOAT(['Unlimited'])	Dead Time None	ns	Dead time value (Source: CAL34)
rad_corr CHUNKED	DOUBLE(['Unlimited', 'Unlimited', 'Unlimited'])	Radiometric Correction None	1	Radiometric Correction (width, strength, deadtime) (Source: CAL34)
strength CHUNKED	DOUBLE(['Unlimited', 'Unlimited'])	Beam Strength None	1	Spot strength in events/shot (strength, deadtime) (Source: CAL34)
width CHUNKED	DOUBLE(['Unlimited', 'Unlimited'])	Apparent Width None	ns	Apparent width (width, deadtime) (Source: CAL34)
Group: /ancillary_data/calibrations/first_photon_bias		CAL19 -First Photon Bias. Provides a correction for first photon bias.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description

cal19_product CHUNKED	STRING(['Unlimited'])	CAL Product Name None	1	Name of ATLAS CAL Products containing the calibration data (Source: CAL19)
Group: /ancillary_data/calibrations/first_photon_bias/gtx		CAL19 -First Photon Bias. Provides a correction for first photon bias.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
dead_time CHUNKED	FLOAT(['Unlimited'])	Dead Time None	ns	Dead time value (Source: CAL19)
ffb_corr CHUNKED	DOUBLE(['Unlimited', 'Unlimited', 'Unlimited'])	FFB Correction None	ps	First Photon Bias Correction (width, strength, deadtime) in picoseconds. (Source: CAL19)
strength CHUNKED	DOUBLE(['Unlimited', 'Unlimited'])	Beam Strength None	1	Spot strength in events/shot (strength, deadtime) (Source: CAL19)
width CHUNKED	DOUBLE(['Unlimited', 'Unlimited'])	Apparent Width None	ns	Apparent width (width, deadtime) (Source: CAL19)
Group: /ancillary_data/calibrations/low_link_impulse_response		CAL20 - System low link impulse response. Calibrates receiver impulse response, including optical and electrically introduced reflections.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
bin_width COMPACT	FLOAT([1])	Bin Width None	seconds	Histogram bin width (Source: CAL20)
cal20_product COMPACT	STRING([1])	CAL Product Name None	1	Name of ATLAS CAL Product containing the calibration data (Source: CAL20)
hist_x CONTIGUOUS	DOUBLE([2000])	Histogram Bin X Values None	1	Histogram bin x-values (Source: CAL20)
laser COMPACT	INTEGER([1])	Laser None	1	Laser Number (Source: CAL20)
mode COMPACT	INTEGER([1])	Laser Power Setting None	1	Laser Power Setting (Source: CAL20)
num_bins COMPACT	INTEGER([1])	Number of Bins None	1	Number of bins in the histogram (Source: CAL20)
return_source COMPACT	INTEGER([1])	Return Source None	1	Source of the events from which the data are derived. (Source: CAL20); (Meanings: [0 1 2 3]) (Values: ['none' 'tep' 'maat' 'echo'])
side COMPACT	INTEGER([1])	A_or_B None	1	A or B Side Component (Source: CAL20); (Meanings: [1 2]) (Values: ['A' 'B'])
temperature COMPACT	FLOAT([1])	Temperature None	degreesC	Temperature for which calibrations are provided. (Source: CAL20)
Group: /ancillary_data/calibrations/low_link_impulse_response/gtx		CAL20 - System low link impulse response. Calibrates receiver impulse response, including optical and electrically introduced reflections.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
hist CONTIGUOUS	DOUBLE([20, 2000])	Histogram None	1	Per-Channel Histogram (Source: CAL20)
total_events COMPACT	INTEGER_8([20])	Total Events None	1	Number of events used in constructing the per-channel histogram (Source: CAL20)
Group: /ancillary_data/gtx		Contains ancillary data used by the signal finding routine described in the ICESat-2 Global Geolocated Photons ATBD.		
Group: /ancillary_data/gtx/signal_find_input		Group contains the setup parameters for the signal finding algorithm.		
data_rate	(Attribute)	Parameters in this group are single-instances valid for the entire file.		
Label	Datatype(Dims)	long_name	units	description

(Layout)	Fillvalue	standard_name		
addpad_flag COMPACT	INTEGER([5])	Additional photon flag None	1	Binary (logical) that if true (=1) then identify additional photon events as padding to achieve htspanin for each time interval sig_find_t_inc. (Source: ATL03, Section 5, Addpad)
alpha_inc COMPACT	DOUBLE([5])	Slope Increment None	radians	Increment by which the slope is varied for slant histogramming over large gaps (Source: ATL03, Section 5, _inc)
alpha_max COMPACT	DOUBLE([5])	Maximum Slope None	radians	Maximum slope allowed for slant histogram; if larger than this then don (Source: ATL03, Section 5, _max)
delta_t_gap_min COMPACT	DOUBLE([5])	Mimimum delta time gap None	seconds	Minimum size of a time gap in the height profile over which to use variable slope slant histogramming. (Source: ATL03, Section 5, _time_gapmin)
delta_t_lin_fit COMPACT	DOUBLE([5])	Linear fit time increment None	seconds	Time span over which to perform a running linear fit to identified signal photon events when editing outliers. Surface type dependent. (Source: ATL03, Section 5, _t_linfit_edit)
delta_t_max COMPACT	DOUBLE([5])	Histogram Maximum time None	seconds	Maximum time interval over which photons are selected to histogram. Surface-type dependent. (Source: ATL03, Section 5, _tmax)
delta_t_min COMPACT	DOUBLE([5])	Histogram Minimum time None	seconds	Minimum time interval over which photons are selected to histogram. Surface-type dependent. (Source: ATL03, Section 5, _tmin)
delta_z_bg COMPACT	DOUBLE([5])	Histogram height bin size for noise calculation from photon cloud None	seconds	Width of a height bin in each atmospheric histogram, Ha, if calculating Ha from the photon cloud. Surface-type dependent. (Source: ATL03, Section 5, _zBG)
delta_zmax2 COMPACT	DOUBLE([5])	Maximum height bin size 2 None	meters	Maximum height bin size for histogramming for second sweep. Surface-type dependent. (Source: ATL03, Section 5, _zmax2)
delta_zmin COMPACT	DOUBLE([5])	Minimum height bin size None	meters	Minimum height bin size for histogramming for first sweep. Surface-type dependent. (Source: ATL03, Section 5, _zmin)
e_a COMPACT	DOUBLE([5])	Multiplier of Ha_sigma None	1	Multiplier of Ha_sigma used to determine which bins in the atmospheric histogram may contain signal photon events. Surface-type dependent. (Source: ATL03, Section 5, ea)
e_linfit_edit COMPACT	DOUBLE([5])	Multiplier of STD of linear fit None	1	Multiplier of standard deviation of linear fit to signal photons used to edit out noise during running linear fit edit of outliers. (Source: ATL03, Section 5, e_linfit_edit)
e_linfit_slant COMPACT	DOUBLE([5])	Multiplier of sigma linfit None	1	Multiplier of sigma_linfit, the standard deviation of the residuals between the actual photon events used to estimate the surface using a linear fit; all photons with height > e_linfit_slant (Source: ATL03, Section 5, e_linfit_slant)
e_m	DOUBLE([5])	Multiplier of STD of	1	Multiplier of standard deviation of the

COMPACT		background None		number of background photon events per bin used in determining signal photon threshold. Surface-type dependent. (Source: ATL03, Section 5, em)
e_m_mult COMPACT	DOUBLE([5])	Multiplier of STD of e_m None	1	Multiplier of e_m used to determine Thsig2, threshold for singular bins. Surface-type dependent. (Source: ATL03, Section 5, em_mult)
htspanmin COMPACT	DOUBLE([5])	Minimum height span None	meters	Minimum height span for each time interval of photons with confidence flag > 0. If the height span is < htspanmin then all photons not previously selected within +/- htspanmin/2 of the median height of the signal photons selected are marked with a confidence flag of 1. Surface-type dependent. (Source: ATL03, Section 5, Htspanmin)
lslant_flag COMPACT	INTEGER([5])	Flag to request slant histogramming for strong beams. None	1	Binary (logical) flag, if true (=1) then perform slant histogramming for the strong beam. Surface-type dependent. (Source: ATL03, Section 5, lslant); (Meanings: [0 1]) (Values: ['false' 'true'])
min_fit_time_fact COMPACT	INTEGER([5])	minimum fit time factor None	seconds	The factor to multiply DTIME by to obtain the minimum time over which to fit a line to a height profile to calculate the local slope using running linear fits, min_fit_time. (Source: ATL03, Section 5, min_fit_time_fact)
n_delta_z1 COMPACT	INTEGER([5])	number of increments in z1 None	counts	The number of increments between delta_zmin and delat_zmax1. Surface-type dependent. (Source: ATL03, Section 5, n_z1)
n_delta_z2 COMPACT	INTEGER([5])	number of increments in z2 None	counts	The number of increments between delta_zmax1 and delta_zmax2. Surface-type dependent. (Source: ATL03, Section 5, n_z2)
nbin_min COMPACT	INTEGER([5])	Minimum number of bins None	counts	Minimum number of bins in a histogram required for the algorithm to be able to process the histogram. (Source: ATL03, Section 5, Nbinmin)
nphot_min COMPACT	INTEGER([5])	Minimum number of photons to fill gap None	counts	The minimum number of photons over which to perform a linear fit to estimate the surface profile across a gap. Surface-type dependent. (Source: ATL03, Section 5, Nphotmin)
nslw COMPACT	DOUBLE([5])	half height for slant histogramming None	meters	Half of the value of the height window used for slant histogramming relative to the surface defined by the linear fit to the surrounding photons at slope, alpha. Surface-type dependent. (Source: ATL03, Section 5, nslw)
nslw_v COMPACT	DOUBLE([5])	Half height for variable slope slant histogramming None	meters	Half the value of the height window used for slant histogramming relative to the surface used when varying the surface slope, alpha, to fill large gaps. Surface-type dependent. (Source: ATL03, Section 5, nslw_v)
out_edit_flag COMPACT	INTEGER([5])	outlier edit flag None	1	Binary (logical) flag, if true (=1) then perform an n _ edit on a running linear fit to identified signal to remove

				outliers. Surface-type dependent. (Source: ATL03, Section 5, Ledit); (Meanings: [0 1]) (Values: ['false' 'true'])
pc_bckgrd_flag COMPACT	INTEGER([5])	calculated background rate flag None	1	Binary (logical) flag, if true (=1) then always use the photon cloud to calculate the background photon rate, if false only use the photon cloud in the absence of the atmospheric histogram. Surface-type dependent. (Source: ATL03, Section 5, Lpcbg); (Meanings: [0 1]) (Values: ['false' 'true'])
r COMPACT	DOUBLE([5])	Minimum ratio None	1	Minimum ratio of max number of photons in histogram bin to mean noise value that must exist to consider a bin a signal bin. (Source: ATL03, Section 5, R)
r2 COMPACT	DOUBLE([5])	Minimum ratio2 None	1	Minimum ratio of (maximum number of photons in any one bin of contiguous signal bins)/(Maximum number of photons in largest bin) in order to accept a group of potential signal bins as signal. Surface-type dependent. (Source: ATL03, Section 5, R2)
sig_find_t_inc COMPACT	DOUBLE([5])	Histogram time increment None	seconds	Time increment the algorithm uses to step through the photon cloud in a granule. Histograms are formed at each sig_find_t_inc interval to identify signal photon events. (Source: ATL03, Section 5, _time)
snrlow COMPACT	DOUBLE([5])	Signal to noise ratio low None	1	Signal to noise ratio below which all selected signal has low confidence. (Source: ATL03, Section 5, snrlow)
snrmed COMPACT	DOUBLE([5])	Signal to noise ratio medium None	1	Signal to noise ratio above which all selected signal has high confidence. Selected signal with signal to noise ratio between snrlow and snrmed is marked as medium confidence. (Source: ATL03, Section 5, snrmed)
t_gap_big COMPACT	DOUBLE([5])	Gap size criteria None	seconds	For time gaps less than this value, slant histogramming is performed relative to the linear slope calculated from the surrounding signal. For time gaps greater than or equal to this value the slope is varied when performing slant histogramming. Surface-type dependent. (Source: ATL03, Section 5, tgapbig)
Group: /ancillary_data/tep		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(Dims) Fillvalue	long_name standard_name	units	description
ds_gt CONTIGUOUS	INTEGER_1([6])	GT Index None	1	Dimension scale for ATLAS Groundtracks (gt1l, gt1r, gt2l, gt2r, gt3l, gt3r) (Source: dim_scale); (Meanings: [1 2 3 4 5 6]) (Values: ['gt1l' 'gt1r' 'gt2l' 'gt2r' 'gt3l' 'gt3r'])
min_tep_ph COMPACT	INTEGER([1])	Minimum TEP photons None	seconds	Minimum number of TEP photons required for computing a TEP histogram. (Source: Derived)

min_tep_secs COMPACT	DOUBLE([1])	Minimum TEP Seconds None	seconds	Minimum seconds of data required for computing a TEP histogram. (Source: Derived)
n_tep_bins COMPACT	INTEGER([1])	Number of Bins None	counts	Number of bins in each TEP histogram (Source: Derived)
tep_bin_size COMPACT	FLOAT([1])	TEP Bin Size None	seconds	Size of each TEP histogram bin. (Source: Derived)
tep_gap_size COMPACT	DOUBLE([1])	TEP Gap Size None	seconds	Minimum number of seconds separating each TEP histogram instance. (Source: Derived)
tep_normalize COMPACT	INTEGER([1])	Normalization Enabled None	1	Indicates if the TEP histogram was normalized. 0=not normalized; 1=normalized (Source: Ops); (Meanings: [0 1]) (Values: ['not_normalized' 'normalized'])
tep_peak_bins COMPACT	INTEGER([1])	Number of Peak Bins to Remove None	counts	Number of peak bins to remove for TEP background computation. (Source: Derived)
tep_prim_window COMPACT	FLOAT([2])	TEP Primary Window None	seconds	The range of the primary TEP window. Bins within this range are used in computing TEP rate. (Source: Derived)
tep_range_prim COMPACT	FLOAT([2])	Range of Primary TEP Window None	seconds	The range of time of flight of TEP photon events to include in generating a histogram or other analaysis of the primary TEP return (Source: ATL03 ATBD)
tep_rm_noise COMPACT	INTEGER([1])	Noise Removal Enabled None	1	Indicates if noise was removed from the TEP histogram. 0=background noise not removed; 1=background noise removed (Source: Ops); (Meanings: [0 1]) (Values: ['noise_not_removed' 'noise_removed'])
tep_sec_window COMPACT	FLOAT([2])	TEP Secondary Window None	seconds	The range of the secondary TEP window. Bins within this range are used in computing TEP rate. (Source: Derived)
tep_start_x COMPACT	FLOAT([1])	TEP Start X None	seconds	Value at the left edge of the first histogram bin. (Source: Derived)
tep_valid_spot COMPACT	INTEGER_1([6])	Index of TEP Spot None	1	A 6x1 array indicating which TEP to use for each spot that does not have a TEP associated with it (e.g. which TEP to use to characterize spots 2, 4, 5, and 6). (Source: ATL03 ATBD); (Meanings: [1 2]) (Values: ['pce1_spot1' 'pce2_spot3'])
Group: /atlas_impulse_response		Contains parameters to characterize the ATLAS pulse energy and pulse shape, derived from the Start Pulse Detector data. These parameters are at the ICESat-2 geolocation segment rate (~20m along-track)		
Group: /atlas_impulse_response/pcex_spotx		Contains parameters to characterize the ATLAS impulse response from the TEP photon histograms available for two of the three strong beams.		
Group: /atlas_impulse_response/pcex_spotx/tep_histogram		Subgroup that contains the time of the histogram centers and the normalized histogram counts for each bin.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
reference_tep_flag COMPACT	INTEGER([1])	Reference TEP Used None	1	Flag that indicates the reference TEP has been used in place of a more recent TEP realization. 0=dynamic

				TEP used; 1=static reference TEP used. (Source: ATL03 ATBD, Section 7.2); (Meanings: [0 1]) (Values: ['dynamic_tep_used,' 'reference_tep_used'])
tep_bckgrd CHUNKED	INTEGER(['Unlimited'])	TEP Background None	counts	The average number of counts in the TEP histogram bins, after excluding bins that likely contain the transmit pulse. (Source: ATL02 ATBD, Section 7.2)
tep_duration CHUNKED	DOUBLE(['Unlimited'])	TEP Duration None	seconds	The duration (or width) of data in the TEP histogram. Will generally be greater than 10 seconds. (Source: ATL02 ATBD, Section 7.2)
tep_hist CHUNKED	DOUBLE(['Unlimited'])	TEP Histogram None	counts	The normalized number of counts in each bin of the TEP histogram. (Source: ATL02 ATBD, Section 7.2)
tep_hist_sum CHUNKED	INTEGER_8(['Unlimited'])	TEP Histogram Sum None	counts	The total number of counts in the TEP histogram, after removing the background. (Source: ATL02 ATBD, Section 7.2)
tep_hist_time CHUNKED	DOUBLE(['Unlimited'])	TEP Histogram Time None	seconds	The times associated with the TEP histogram bin centers, measured from the laser transmit time. (Source: ATL02 ATBD, Section 7.2)
tep_tod CHUNKED	DOUBLE(['Unlimited'])	TEP Time Of Day time	seconds since 2018-01-01	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. (Source: ATL02 ATBD, Section 7.2)
Group: /gtx		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/bckgrd_atlas		Contains data related to the 50-shot background count, including telemetry and range windows.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
bckgrd_counts CHUNKED	INTEGER(['Unlimited'])	ATLAS 50-shot background count None	counts	Onboard 50 shot background (200 Hz) sum of photon events within the altimetric range window. (Source: ATL03 ATBD Section 7.3)
bckgrd_counts_reduced CHUNKED	INTEGER(['Unlimited'])	ATLAS 50-shot background count - reduced None	counts	Number of photon counts in the 50-shot sum after subtracting the number of signal photon events, defined as in ATBD Section 5, in that span. (Source: ATL03 ATBD Section 7.3)
bckgrd_hist_top CHUNKED	FLOAT(['Unlimited'])	Top of the altimetric range window None	meters	The height of the top of the altimetric histogram, in meters above the WGS-84 ellipsoid, with all geophysical corrections applied. Parameter is

				ingested at 50-Hz, and values are repeated to form a 200-Hz array. (Source: ATL03 ATBD Section 7.3)
bckgrd_int_height CHUNKED	FLOAT(['Unlimited'])	Altimetric range window width None	meters	The height of the altimetric range window. This is the height over which the 50-shot sum is generated. Parameter is ingested at 50-Hz, and values are repeated to form a 200-Hz array. (Source: ATL03 ATBD Section 7.3)
bckgrd_int_height_reduced CHUNKED	FLOAT(['Unlimited'])	Altimetric range window height - reduced None	meters	The height of the altimetric range window after subtracting the height span of the signal photon events in the 50-shot span. (Source: ATL03 ATBD Section 7.3)
bckgrd_rate CHUNKED	FLOAT(['Unlimited'])	Background count rate based on the ATLAS 50-shot sum None	counts / second	The background count rate from the 50-shot altimetric histogram after removing the number of likely signal photons based on Section 5. (Source: ATL03 ATBD Section 7.3)
delta_time CHUNKED	DOUBLE(['Unlimited'])	Time at the start of ATLAS 50-shot sum time	seconds since 2018-01-01	Elapsed GPS Seconds from the ATLAS SDP GPS Epoch, referenced to the start of the 50-shot sum. This is based on every fiftieth laser fire time, which leads to a very close alignment with major frame boundaries (+/- 1 shot). 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. (Source: ATL02)
pce_mframe_cnt CHUNKED	INTEGER_8(['Unlimited'])	PCE Major frame counter None	counts	Major Frame ID - The major frame ID is read from the DFC and starts counting at DFC POR. The counter is used to identify individual major frames across diag and science packets. This counter can go for about 2.7 years before rolling over. It is in the first time tag science packet. Used as part of the photon ID and the safest way to align data within different APIDs or at different rates. (Source: ATL02)
tlm_height_band1 CHUNKED	FLOAT(['Unlimited'])	Height of the telemetry band 1 None	meters	The height in meters of the telemetry band 1. (Source: ATL03 ATBD, Section 7.3.2)
tlm_height_band2 CHUNKED	FLOAT(['Unlimited'])	Height of the telemetry band 2 None	meters	The height in meters of the telemetry band 2. (if 0, second band is not present). (Source: ATL03 ATBD, Section 7.3.2)
tlm_top_band1 CHUNKED	FLOAT(['Unlimited'])	Ellipsoidal height of the top of the telemetry band 1. None	meters	The ellipsoidal heights with respect to WGS-84 of the top of the telemetry band 1, with all geophysical corrections applied. (Source: ATL03 ATBD, Section 3.2, 7.3.2)
tlm_top_band2 CHUNKED	FLOAT(['Unlimited'])	Ellipsoidal height of the top of the telemetry band 2. None	meters	The ellipsoidal heights with respect to WGS-84 of the top of the telemetry band 2, with all geophysical

				corrections applied. (Source: ATL03 ATBD, Section 3.2, 7.3.2)
Group: /gtx/geolocation		Contains parameters related to geolocation. The rate of all of these parameters is at the rate corresponding to the ICESat-2 Geolocation Along Track Segment interval (nominally 20 m along-track). In the case of no photons within the segment (segment_ph_cnt=0), most parameters are filled with invalid or best-estimate values. Maintaining geolocation segments with no photons allows for the geolocation segment arrays to be directly aligned across the gtx groups.		
data_rate	(Attribute)	Data within this group are stored at the ICESat-2 20m segment rate.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
altitude_sc CHUNKED	DOUBLE(['Unlimited']) INVALID_R8B	Altitude None	meters	Height of the spacecraft above the WGS84 ellipsoid. (Source: ATL03g ATBD, Section 3.4)
bounce_time_offset CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	ground bounce time offset None	seconds	The difference between the transmit time and the ground bounce time of the reference photons. (Source: ATL03 ATBD, Section 3.3)
delta_time CHUNKED	DOUBLE(['Unlimited'])	Delta Time time	seconds since 2018-01-01	Transmit time of the reference photon, measured in seconds from the atlas_sdp_gps_epoch. If there is no reference photon, this time corresponds to the approximate mid-point time associated with the along-track geolocation segment edge. 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. (Source: Derived)
full_sat_fract CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Full Saturation Fraction None	1	The fraction of pulses within the segment determined to be fully saturated. (Source: ATL03 ATBD)
near_sat_fract CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Near Saturation Fraction None	1	The fraction of pulses within the segment determined to be nearly saturated. (Source: ATL03 ATBD)
neutat_delay_derivative CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	(Neutral Atmosphere delay)/dh None	meters/meters	Change in neutral atmospheric delay per height change (Source: ATL03a ATBD)
neutat_delay_total CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Total Neutral Atmospheric Delay None	meters	Total neutral atmosphere delay correction (wet+dry). (Source: ATL03a ATBD)
neutat_ht CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Neutral atmosphere ref height None	meters	Reference height of the neutral atmosphere range correction (Source: ATL03a ATBD)
ph_index_beg CHUNKED	INTEGER_8(['Unlimited']) 0	Photon Index Begin None	counts	Index (1-based) within the photon-rate data of the first photon within this segment. Use in conjunction with segment_ph_cnt. (Source: Derived)
pitch CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Pitch None	degrees	Spacecraft pitch, roll, and yaw angles, are computed using 3, 2, 1 Euler angle sequence, posted at the geolocation segment rate, and the

				units are degrees. Angles represent the deviation from a coordinate system whose z-axis is perpendicular to the reference ellipsoid of the Earth (pointing nadir), y-axis is perpendicular to the orbit plane, and x-axis completes the triad in the direction of spacecraft velocity. Note: yaw angle is near 0deg when ICESat-2 is flying forward (positive beta angle), near 180deg when ICESat-2 is flying backward (negative beta angle). (Source: ANC04)
podppd_flag CHUNKED	INTEGER_1(['Unlimited']) 0	POD_PPD Flag None	1	Composite POD/PPD flag that indicates the quality of input geolocation products for the specific ATL03 segment. A non-zero value may indicate that geolocation solutions are degraded. The ATL03 sigma values should indicate the degree of uncertainty associated with the degradation. Possible values are: 0=NOMINAL; 1=POD_DEGRADE; 2=PPD_DEGRADE; 3=PODPPD_DEGRADE. (Source: ANC04, ANC05); (Meanings: [0 1 2 3]) (Values: ['nominal' 'pod_degrade' 'ppd_degrade' 'podppd_degrade'])
range_bias_corr CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	range bias correction None	meters	The range_bias estimated from geolocation analysis. (Source: ATL03G ATBD, Section 3.6)
ref_azimuth CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Azimuth azimuth	radians	Azimuth 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. (Source: ATL03G ATBD, Section 3.3)
ref_elev CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	elevation elevation	radians	Elevation of the unit pointing vector for the reference photon in the local ENU frame in radians. The angle is measured from East-North plane and positive towards Up (Source: ATL03G ATBD, Section 3.3)
reference_photon_index CHUNKED	INTEGER(['Unlimited']) 0	Reference Photon Index None	counts	Index of the reference photon within the set of photons grouped within in segment. To recover the position of the reference photon within the photon-rate arrays, add ref_ph_ndx to the corresponding ph_ndx_beg and subtract 1. If no reference photon was selected, this value will indicate that the reference photon defaulted to the first photon. In the case of no photons within the segment (segment_ph_cnt=0), the value should be 0. (Source: ATL03 ATBD, Section 3.2)
reference_photon_lat CHUNKED	DOUBLE(['Unlimited'])	Segment Latitude latitude	degrees_north	Latitude of each reference photon. Computed from the ECF Cartesian coordinates of the bounce point. In the case of no photons within the segment (segment_ph_cnt=0), the coordinates are the midpoint of the geolocation segment on the reference ground track. (Source: ATL03G ATBD, Section 3.4)
reference_photon_lon	DOUBLE(['Unlimited'])	Segment Longitude	degrees_east	Longitude of each reference photon.

CHUNKED		longitude		Computed from the ECF Cartesian coordinates of the bounce point. In the case of no photons within the segment (segment_ph_cnt=0), the coordinates are the midpoint of the geolocation segment on the reference ground track. (Source: ATL03G ATBD, Section 3.4)
roll CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	roll None	degrees	Spacecraft pitch, roll, and yaw angles, are computed using 3, 2, 1 Euler angle sequence, posted at the geolocation segment rate, and the units are degrees. Angles represent the deviation from a coordinate system whose z-axis is perpendicular to the reference ellipsoid of the Earth (pointing nadir), y-axis is perpendicular to the orbit plane, and x-axis completes the triad in the direction of spacecraft velocity. Note: yaw angle is near 0deg when ICESat-2 is flying forward (positive beta angle), near 180deg when ICESat-2 is flying backward (negative beta angle). (Source: ANC04)
segment_dist_x CHUNKED	DOUBLE(['Unlimited'])	Segment Distance from EQC None	meters	Along-track distance from the equator crossing to the start of the 20 meter geolocation segment. (Source: Derived)
segment_id CHUNKED	INTEGER(['Unlimited'])	along-track segment ID number. None	1	A 7 digit number identifiying the along-track geolocation segment number. These are sequential, starting with 1 for the first segment after an ascending equatorial crossing node. (Source: ATL03 ATBD, Section 3.1)
segment_length CHUNKED	DOUBLE(['Unlimited'])	along-track segment length None	meters	The along-track length of the along-track segment. Nominally these are 20m, but they vary from 19.8m to 20.2m. (Source: ATL03 ATBD, Section 3.1)
segment_ph_cnt CHUNKED	INTEGER(['Unlimited']) 0	Number of photons None	counts	Number of photons in a given along-track segment. In the case of no photons within the segment (segment_ph_cnt=0), most other parameters are filled with invalid or best-estimate values. Maintaining geolocation segments with no photons allows for the geolocation segment arrays to be directly aligned across the gtx groups. (Source: Derived)
sigma_across CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	across-track geolocation uncertainty None	meters	Estimated Cartesian across-track uncertainity (1-sigma) for the refrerence photon (Source: ATL03G ATBD)
sigma_along CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	along-track geolocation uncertainity None	meters	Estimated cartesian along-track uncertainty (1-sigma) for the reference photon (Source: ATL03G ATBD)
sigma_h CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	height uncertainty None	1	Estimated height uncertainty (1-sigma) for the reference photon bounce point. (Source: ATL03G ATBD, Section 3.6)
sigma_lat CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	latitude uncertainty None	1	Estimated geodetic Latitude uncertainty (1-sigma), for the reference photon bounce point.

				(Source: ATL03G ATBD, Section 3.6)
sigma_lon CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	longitude uncertainty None	degrees	Estimated geodetic east Longitude uncertainty (1-sigma), for the reference photon bounce point. (Source: ATL03G ATBD, Section 3.6)
solar_azimuth CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	solar azimuth None	degrees_east	The azimuth of the sun position vector from the reference photon bounce point position in the local ENU frame. The angle is measured from North and is positive towards East. ATL03g provides this value in radians; it is converted to degrees for ATL03 output. (Source: ATL03G ATBD, Section 3.3)
solar_elevation CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	solar elevation None	degrees	The elevation of the sun position vector from the reference photon bounce point position in the local ENU frame. The angle is measured from the East-North plane and is positive Up. ATL03g provides this value in radians; it is converted to degress for ATL03 output. (Source: ATL03G ATBD, Section 3.3)
surf_type CHUNKED	INTEGER_1(['Unlimited', 5])	Surface Type None	1	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. (Source: ATL03 ATBD, Section 4); (Meanings: [0 1]) (Values: ['not_type' 'is_type'])
tx_pulse_energy CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Transmit Pulse Energy None	Joules	The average transmit pulse energy, measured by the internal laser energy monitor, split into per-beam measurements. (Source: ATL02 ATBD, Section 7.2)
tx_pulse_skew_est CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Transmit Pulse Skew Estimate None	seconds	The difference between the averages of the lower and upper threshold crossing times. This is an estimate of the transmit pulse skew. (Source: ATL02 ATBD, Section 7.2)
tx_pulse_width_lower CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Transmit Pulse Energy Lower Width None	seconds	The average distance between the lower threshold crossing times measured by the Start Pulse Detector. (Source: ATL02 ATBD, Section 7.2)
tx_pulse_width_upper CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Transmit Pulse Energy Upper Width None	seconds	The average distance between the upper threshold crossing times measured by the Start Pulse Detector. (Source: ATL02 ATBD, Section 7.2)
velocity_sc CHUNKED	FLOAT(['Unlimited', 3]) INVALID_R4B	spacecraft velocity None	meters/second	Spacecraft velocity components (east component, north component, up component) an observer on the ground would measure. While values are common to all beams, this parameter is naturally produced as part of geolocation. (Source: ATL03G ATBD)
yaw CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Yaw None	degrees	Spacecraft pitch, roll, and yaw angles, are computed using 3, 2, 1 Euler angle sequence, posted at the geolocation segment rate, and the units are degrees. Angles represent the deviation from a coordinate system whose z-axis is perpendicular to the reference ellipsoid of the Earth (pointing nadir), y-axis is

				perpendicular to the orbit plane, and x-axis completes the triad in the direction of spacecraft velocity. Note: yaw angle is near 0deg when ICESat-2 is flying forward (positive beta angle), near 180deg when ICESat-2 is flying backward (negative beta angle). (Source: ANC04)
Group: /gtx/geophys_corr		Contains parameters used to correct photon heights for selected geophysical effects. Additional geophysical parameters (dac and tide_ocean) are not applied and provided for informational purposes only. All parameters are posted at the same interval as the ICESat-2 Geolocation Along-Track Segment interval (nominally 20m along-track). In the case of no photons within the segment (../geolocation/segment_ph_cnt=0), most parameters are filled with invalid or best-estimate values. Maintaining geolocation segments with no photons allows for the geolocation segment arrays to be directly aligned across the gtx groups.		
data_rate	(Attribute)	These parameters are stored at the ICESat-2 Geolocation Along Track Segment rate (nominally every 20 m along-track).		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
dac CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Dynamic Atmosphere Correction None	meters	Dynamic Atmospheric Correction (DAC) includes inverted barometer (IB) effect. This correction is not applied to the photon heights and provided only as supplemental information. (Source: ATL03 ATBD, Section 6.3.2)
delta_time CHUNKED	DOUBLE(['Unlimited'])	Elapsed GPS seconds time	seconds since 2018-01-01	Elapsed seconds from the ATLAS SDP GPS Epoch, corresponding to the transmit time of the reference photon. 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. (Source: Operations)
dem_flag CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	dem source flag None	1	Indicates source of the DEM height. Values: 0=None, 1=Arctic, 2=Global, 3=MSS, 4=Antarctic. (Source: ATL03 ATBD Section 6.3); (Meanings: [0 1 2 3 4]) (Values: ['none' 'arctic' 'global' 'mss' 'antarctic'])
dem_h CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	DEM Height None	meters	Best available DEM height (in priority of Arctic/Antarctic/Global/MSS) interpolated to the location of the reference photon. (Source: ATL03 ATBD Section 6.3)
geoid CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Geoid None	meters	Geoid height above WGS-84 reference ellipsoid (range -107 to 86m) in the tide-free system. Not applied on the product; requested by higher-level products. (see geoid_free2mean to convert to the mean-tide system) (Source: ATL03 ATBD, Section 6.3.8)
geoid_free2mean CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Geoid Free-to-Mean conversion None	meters	Additive value to convert geoid heights from the tide-free system to the mean-tide system. (Add to geoid to get the geoid heights in the mean-tide system.)

				(Source: ATL03 ATBD, Section 6.3.8)
tide_earth CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Earth Tide None	meters	Solid earth tide in the tide-free system. (see tide_earth_free2mean to convert to the mean-tide system) (Source: ATL03 ATBD, Section 6.3.3)
tide_earth_free2mean CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Earth Tide Free-to-Mean conversion None	meters	Additive value to convert solid earth tide from the tide-free system to the mean tide system. (Add to tide_earth to get solid earth tides in the mean-tide system.) (Source: ATL03 ATBD, Section 6.3.8)
tide_equilibrium CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Long Period Equilibrium Tide None	meters	Long period equilibrium tide self-consistent with ocean tide model (+-0.04m). This correction is not applied to the photon heights and is provided only as a supplemental information. (Source: ATL03 ATBD, Section 6.3.1)
tide_load CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Load Tide None	meters	Load Tide - Local displacement due to Ocean Loading (-6 to 0 cm). (Source: ATL03 ATBD, Section 6.3.4)
tide_oc_pole CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Ocean Pole Tide None	meters	Surface deformation of the Earth due to loading from the centrifugal effect of polar motion upon the oceans (-2 to 2 mm). (Source: ATL03 ATBD, Section 6.3.6)
tide_ocean CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Ocean Tide None	meters	Ocean Tides including diurnal and semi-diurnal (harmonic analysis), and longer period tides (dynamic and self-consistent equilibrium). This correction is not applied to the photon heights and provided only as supplemental information. (Source: ATL03 ATBD, Section 6.3.1)
tide_pole CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Solid Earth Pole Tide None	meters	Solid Earth Pole Tide -Rotational deformation due to polar motion (-1.5 to 1.5 cm). (Source: ATL03 ATBD, Section 6.3.5)
Group: /gtx/heights		Contains arrays of the parameters for each received photon.		
data_rate	(Attribute)	Data are stored at the photon detection rate.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
delta_time CHUNKED	DOUBLE(['Unlimited'])	Elapsed GPS seconds time	seconds since 2018-01-01	The transmit time of a given photon, measured in seconds from the ATLAS Standard Data Product Epoch. Note that multiple received photons associated with a single transmit pulse will have the same delta_time. 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. (Source: Operations)
dist_ph_across CHUNKED	FLOAT(['Unlimited'])	Distance off RGT. None	meters	Across-track distance projected to the ellipsoid of the received photon from the reference ground track. This is based on the Along-Track Segment

				algorithm described in Section 3.1. (Source: ATL03 ATBD, Section 3.1)
dist_ph_along CHUNKED	FLOAT(['Unlimited'])	Distance from equator crossing. None	meters	Along-track distance in a segment projected to the ellipsoid of the received photon, based on the Along-Track Segment algorithm. Total along track distance can be found by adding this value to the sum of segment lengths measured from the start of the most recent reference groundtrack. (Source: ATL03 ATBD, Section 3.1)
h_ph CHUNKED	FLOAT(['Unlimited'])	Photon WGS84 Height height	meters	Height of each received photon, relative to the WGS-84 ellipsoid including the geophysical corrections noted in Section 6. Please note that neither the geoid, ocean tide nor the dynamic atmosphere (DAC) corrections are applied to the ellipsoidal heights. (Source: ATL03g ATBD, Section 3.4)
lat_ph CHUNKED	DOUBLE(['Unlimited'])	Latitude latitude	degrees_north	Latitude of each received photon. Computed from the ECF Cartesian coordinates of the bounce point. (Source: ATL03g ATBD, Section 3.4)
lon_ph CHUNKED	DOUBLE(['Unlimited'])	Longitude longitude	degrees_east	Longitude of each received photon. Computed from the ECF Cartesian coordinates of the bounce point. (Source: ATL03g ATBD, Section 3.4)
pce_mframe_cnt CHUNKED	UINT_4_LE(['Unlimited'])	PCE Major frame counter None	counts	The major frame counter is read from the digital flow controller in a given PCE card. The counter identifies individual major frames across diag and science packets. Used as part of the photon ID. (Source: Retained from prior a_alt_science_ph packet)
ph_id_channel CHUNKED	UINT_1_LE(['Unlimited'])	Receive channel id None	1	Channel number assigned for each received photon event. This is part of the photon ID. Values range from 1 to 120 to span all channels and rise/fall edges. Values 1 to 60 are for falling edge; PCE1 (1 to 20), PCE 2 (21 to 40) and PCE3 (41 to 60). Values 61 to 120 are for rising edge; PCE1 (61 to 80), PCE 2 (81 to 100) and PC3 (101 to 120). (Source: Derived as part of Photon ID)
ph_id_count CHUNKED	INTEGER_1(['Unlimited'])	photon event counter None	counts	The photon event counter is part of photon ID and counts from 1 for each channel until reset by laser pulse counter. (Source: Derived as part of Photon ID)
ph_id_pulse CHUNKED	UINT_1_LE(['Unlimited'])	laser pulse counter None	counts	The laser pulse counter is part of photon ID and counts from 1 to 200 and is reset for each new major frame. (Source: Derived as part of Photon ID)
quality_ph CHUNKED	INTEGER_1(['Unlimited'])	Photon Quality None	1	Indicates the quality of the associated photon. 0=nominal, 1=possible_afterpulse, 2=possible_impulse_response_effect, 3=possible_tep. Use this flag in conjunction with signal_conf_ph to identify those photons that are likely

				noise or likely signal. (Source: ATL03 ATBD); (Meanings: [0 1 2 3]) (Values: ['nominal' 'possible_afterpulse' 'possible_impulse_response_effect' 'possible_tep'])
signal_conf_ph CHUNKED	INTEGER_1(['Unlimited', 5])	Photon Signal Confidence None	1	Confidence level associated with each photon event selected as signal. 0=noise. 1=added to allow for buffer but algorithm classifies as background; 2=low; 3=med; 4=high). This parameter is a 5xN array where N is the number of photons in the granule, and the 5 rows indicate signal finding for each surface type (in order: land, ocean, sea ice, land ice and inland water). Events not associated with a specific surface type have a confidence level of -1. Events evaluated as TEP returns have a confidence level of -2. (Source: ATL03 ATBD, Section 5, Conf); (Meanings: [-2 -1 0 1 2 3 4]) (Values: ['possible_tep' 'not_considered' 'noise' 'buffer' 'low' 'medium' 'high'])
Group: /gtx/signal_find_output		Parameters output for each time interval for which signal photons were selected, and the confidence flag set, based on the algorithm in Section 5. Histogram parameters are from the histogram that was used to identify signal photons and set the confidence parameter for a given time increment.		
data_rate	(Attribute)	Data are stored at the rate of signal finding time intervals.		
Group: /gtx/signal_find_output/surf_type		Surface-type specific parameters output for each time interval for which signal photons were selected, based on the algorithm in Section 5. Histogram parameters are from the histogram that was used to identify signal photons and set the confidence parameter for a given time increment.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
bckgrd_mean CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	background counts per bin None	counts	The mean of the number of background counts expected in one height bin of the histogram of width dzATM over time period, dtATM (Source: ATL03 ATBD, Section 5)
bckgrd_sigma CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	background counts per bin sigma None	counts	The standard deviation of the number of background counts expected in one height bin of the histogram of width dzATM over time period, dtATM (Source: ATL03 ATBD, Section 5)
delta_time CHUNKED	DOUBLE(['Unlimited'])	Elapsed GPS seconds time	seconds since 2018-01-01	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. (Source: Derived via Time Tagging)
t_pc_delta CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	bin width size None	seconds	The histogram bin width (integration time) along-track used to find signal photons. (Source: ATL03 ATBD, Section 5)
z_pc_delta	FLOAT(['Unlimited'])	bin height size	meters	Height bin size of the histogram used

CHUNKED	INVALID_R4B	None		to find signal photons. (Source: ATL03 ATBD, Section 5)
Group: /orbit_info		Contains data that are common among all beams for the granule. These parameters are constants for a given granule.		
data_rate	(Attribute)	These parameters are constant for a given granule.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
crossing_time CHUNKED	DOUBLE(['Unlimited'])	Ascending Node Crossing Time time	seconds since 2018-01-01	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. (Source: POD/PPD)
cycle_number CHUNKED	INTEGER_1(['Unlimited'])	Cycle Number None	counts	Tracks the number of 91-day cycles in the mission, beginning with 01. A unique orbit number can be determined by subtracting 1 from the cycle_number, multiplying by 1387 and adding the rgt value. (Source: POD/PPD)
lan CHUNKED	DOUBLE(['Unlimited'])	Ascending Node Longitude None	degrees_east	Longitude at the ascending node crossing. (Source: POD/PPD)
orbit_number CHUNKED	UINT_2_LE(['Unlimited'])	Orbit Number None	1	Unique identifying number for each planned ICESat-2 orbit. (Source: Operations)
rgt CHUNKED	INTEGER_2(['Unlimited'])	Reference Ground track None	counts	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 GT2L and GT2R. During slews or off-pointing, it is possible that ground tracks may intersect the RGT. The ICESat-2 mission has 1387 RGTs. (Source: POD/PPD)
sc_orient CHUNKED	INTEGER_1(['Unlimited'])	Spacecraft Orientation None	1	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. (Source: POD/PPD); (Meanings: [0 1 2]) (Values: ['backward' 'forward' 'transition'])
sc_orient_time CHUNKED	DOUBLE(['Unlimited'])	Time of Last Spacecraft Orientation Change	seconds since 2018-01-01	The time of the last spacecraft orientation change between forward,

		time		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. (Source: POD/PPD)
Group: /quality_assessment		Contains quality assessment data. This may include QA counters, QA along-track data and/or QA summary data.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
delta_time CONTIGUOUS	DOUBLE([1])	Elapsed GPS seconds time	seconds since 2018-01-01	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. (Source: Operations)
qa_granule_fail_reason COMPACT	INTEGER([1])	Granule Failure Reason None	1	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. (Source: Operations); (Meanings: [0 1 2 3 4 5]) (Values: ['no_failure' 'PROCESS_ERROR' 'INSUFFICIENT_OUTPUT' 'failure_3' 'failure_4' 'OTHER_FAILURE'])
qa_granule_pass_fail COMPACT	INTEGER([1])	Granule Pass Flag None	1	Flag indicating granule quality. 0=granule passes automatic QA. 1=granule fails automatic QA. (Source: Operations); (Meanings: [0 1]) (Values: ['PASS' 'FAIL'])
Group: /quality_assessment/gtx		Each group contains the quality assessment information for one Ground Track.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
qa_perc_signal_conf_ph_high CONTIGUOUS	DOUBLE([1, 5])	Percent_Signal_Conf_Ph_HIgh None	percent	The percentage of high-confidence signal photons for each surface type, based on the total number of photons for each surface type. (Source: ATL03 ATBD, Section 8)

qa_perc_signal_conf_ph_low CONTIGUOUS	DOUBLE([1, 5])	Percent_Signal_Conf_Ph_Low None	percent	The percentage of low-confidence signal photons for each surface type, based on the total number of photons for each surface type. (Source: ATL03 ATBD, Section 8)
qa_perc_signal_conf_ph_med CONTIGUOUS	DOUBLE([1, 5])	Percent_Signal_Conf_Ph_Med None	percent	The percentage of medium-confidence signal photons for each surface type, based on the total number of photons for each surface type. (Source: ATL03 ATBD, Section 8)
qa_perc_surf_type CONTIGUOUS	DOUBLE([1, 5])	Percent_Surface_Type None	percent	The percentage of geolocation segments for each surface type, based on the total number of geolocation segments. (Source: ATL03 ATBD, Section 8)
qa_total_signal_conf_ph_high CONTIGUOUS	INTEGER_8([1, 5])	Total_Signal_Conf_Ph_HIgh None	1	The total number of high-confidence signal photons for each surface type. (Source: ATL03 ATBD, Section 8)
qa_total_signal_conf_ph_low CONTIGUOUS	INTEGER_8([1, 5])	Total_Signal_Conf_Ph_Low None	1	The total number of low-confidence signal photons for each surface type. (Source: ATL03 ATBD, Section 8)
qa_total_signal_conf_ph_med CONTIGUOUS	INTEGER_8([1, 5])	Total_Signal_Conf_Ph_Med None	1	The total number of medium-confidence signal photons for each surface type. (Source: ATL03 ATBD, Section 8)