ATL13 Product Data Dictionary

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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 (ATL13) contains along track surface heights of inland water bodies, including lakes, estuaries and rivers. Water surface slope and descriptive statistics are also provided. The data were acquired by the Advanced Topographic Laser Altimeter S
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)	ATL13
hdfversion	(Attribute)	SET_BY_PGE
history	(Attribute)	SET_BY_PGE
identifier_file_uuid	(Attribute)	SET_BY_PGE
identifier_product_doi	(Attribute)	10.5067/ATLAS/ATL13.001
identifier_product_doi_authority	(Attribute)	http://dx.doi.org
identifier_product_format_version	(Attribute)	SET_BY_PGE
identifier_product_type	(Attribute)	ATL13
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)	ATL13	
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	

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.
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/inland_water				
Description	(Attribute)	Contains general ancillary parameters.		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
anmly_test COMPACT	FLOAT (4)	Anomaly Test	meters ATBD Table 5-2	Array containing threshold values against which to test segments for anomalous changes in height. The mode of each segment histogram will be tested against ht_water_coarse and excluded if the difference is greater than the value associated with the segment
atm_window1 COMPACT	FLOAT (1)	ATM Background Window Bottom	meters ATBD Table 5-2	Lower limit of height above coarse water surface height for atmospheric background count calculation.
atm_window2 COMPACT	FLOAT (1)	ATM Background Window Top	meters ATBD Table 5-2	Upper limit of height above coarse water surface height for atmospheric background count calculation.
b1_sseg1 COMPACT	FLOAT (1)	Small Segment Bin Size	meters ATBD Table 5-2	Bin size to be used for histogramming of each small segment.
b2_sseg1 COMPACT	FLOAT (1)	Small Segment Height Bin Size	meters ATBD Table 5-2	Bin size to be used for histogramming of small segment heights.
b_long COMPACT	FLOAT (1)	Long Bin Size	meters ATBD Table 5-2	Bin size to be used by which to establish a histogram of long segments.
bckgrd_threshold COMPACT	FLOAT (2)	Background Threshold	counts/sec ATBD Table 5-2	Thresholds outside of which computed background is flagged (High, Low).
bin_detrend COMPACT	FLOAT (1)	Detrend Bin Size	meters ATBD Table 5-2	Bin size used to establish a band of heights over which to determine the detrending equation.
c_adj COMPACT	FLOAT (1)	C Adjustment	1 ATBD Table 5-2	Adjustment for the speed of light through water (cl)
c_fresnel COMPACT	FLOAT (1)	Fresnel Coeff	1 ATBD Table 5-2	Fresnel specular reflection coefficient @ 532 nm
detrend_width COMPACT	FLOAT (1)	Detrend Width	1 ATBD Table 5-2	Number of standard deviations +/- mode to include in detrend band.

f2_d_min COMPACT	FLOAT (1)	Minimum Distance Thres	meters ATBD Table 5-2	Minimum distance threshold between photons required for inclusion in algorithm.
gauss_pk_thres COMPACT	FLOAT (1)	Gaussian Peak Threshold	1 ATBD Table 5-2	Fraction of the peak amplitude above which Gaussian fit error analysis is executed (ie, calculate error on Gaussian only between the peak amplitude and gauss_pk_thres * peak)
geoseg_edge_buffer COMPACT	INTEGER_1 (9 x 9)	geosegment edge buffer	1 ATL13 ATBD, Section 5.2, Table 5-2	Number of geosegments to include in the water surface calculation that are outside of both water body edges, as identified by reference photon location comparison to water body shapes. Flag Values: ['0', '1', '2', '3', '4', '5'] Flag Meanings: ['buffer_0', 'buffer_1', 'buffer_2', 'buffer_3', 'buffer_4', 'buffer_5']
h_mavg_a COMPACT	INTEGER (1)	Num Depth Bins A	meters ATBD Table 5-2	Number of depth bins over which to compute H_mavg_a
h_mavg_b COMPACT	INTEGER (1)	Num Depth Bins B	meters ATBD Table 5-2	Number of depth bins over which to compute H_mavg_b
h_mavg_c COMPACT	INTEGER (1)	Num Depth Bins C	meters ATBD Table 5-2	Number of bins over which to calculate moving average
l_sub COMPACT	INTEGER (1)	Long Subsurface Segment Size	1 ATBD Table 5-2	Long segment size, operationally used as unit length over which to characterize the subsurface, and deconvolve the instrument pulse and subsurface effects from the water surface response.
l_surf COMPACT	INTEGER (1)	Long Surface Segment Size	1 ATBD Table 5-2	Long segment size, operationally used as unit length over which to detrend the water surface, characterize the surface, and deconvolve the instrument pulse and subsurface effects from the water surface response.
lsbr_threshold COMPACT	FLOAT (1)	LSBR Threshold	1 ATBD Table 5-2	Threshold at which the LSBR indicates a significant transition from signal photon richness to noise.
m_avg_d COMPACT	INTEGER (1)	Num Depth Bins D	meters ATBD Table 5-2	Number of depth bins over which to compute P_ht_long_subsurf_mavg
max_gseg_search COMPACT	INTEGER (1)	Max Geoseg Search Radius	1 ATBD Table 5-2	Maximum number of geosegments in either direction to search for reported water surface heights
ref_dist_iw_bdy COMPACT	FLOAT (1)	Reference Difference	meters ATBD Table 5-2	Maximum distance from a water body that a geosegment reference photon indicates the need for overlap testing each individual photon in the geosegment
s_seg1 COMPACT	INTEGER (1)	Short Segment Length	1 ATBD Table 5-2	Short segment size, operationally used as unit length over which to identify water surface height anomalies such as islands, bridges, etc.
shore_buff_sseg_length COMPACT	INTEGER (1)	Shore buffer short segment length	1 ATL13 ATBD, Section 5.2, Table 5-2	Maximum length of a short segment that can be marked as anomalous due to shore buffering.
shore_buffer COMPACT	INTEGER_1 (9 x 9)	Shore buffer	1 ATL13 ATBD, Section 5.2, Table 5-2	Number of near-shore short segments to ignore in analysis due to near-shore influences. Flag Values: ['0', '1'] Flag Meanings: ['buffer_0', 'buffer_1']
sig_threshold COMPACT	INTEGER (1)	Signal Confidence Threshold	1 ATBD Table 5-2	Minimum signal confidence required for photon to be included in analysis
signal_window_bottom COMPACT	FLOAT (1)	Signal Window Bottom	meters ATBD Table 5-2	Lower limit below coarse water surface to include photons for analysis.
signal_window_top COMPACT	FLOAT (1)	Signal Window Top	meters ATBD Table 5-2	Upper limit above coarse water surface to include photons for analysis.
size_to_process COMPACT	INTEGER_1 (9 x 9)	Size to Process	1 ATL13 ATBD, Section 4.7.1.2, Table 5-4	Water body sizes that are to be processed by the ATL13 algorithm for each water body type. This parameter is a rank 2 array of size 9x9, where array subscripts 1 through 9, coincide

				with body type digits along columns, and body size digits along rows. Array elements are binary values, if 0 then process body size for that type, 1 otherwise. Water body sizes are described in ATL13 chapter 4.7.1.2 and in Table 5-4. Flag Values: ['0', '1'] Flag Meanings: ['process_size', 'otherwise']
sseg_length_test COMPACT	FLOAT (1)	Short Segment Length Test	meters ATBD Table 5-2	Threshold by which to test the length of a short segment to determine if it is anomalous or not anomalous.
sseg_mode_cnt_test CHUNKED	INTEGER_1 (6)	Short segment mode count test	1 ATBD Table 5-2	Threshold to test number of values contained in short segment histogram multimodes against for inclusion or exclusion of short segment Flag Values: ['10', '10', '7', '7', '7', '7'] Flag Meanings: ['sseg_stdev_thres_1', 'sseg_stdev_thres_2', 'sseg_stdev_thres_3', 'sseg_stdev_thres_4', 'sseg_stdev_thres_5', 'sseg_stdev_thres_6']
sseg_mode_freq_test COMPACT	INTEGER (1)	Short Segment Mode Frequency Test	1 ATBD Table 5-2	Threshold to test number of short segment histogram modes against for inclusion or exclusion of short segment.
sseg_mode_spread_test COMPACT	FLOAT (1)	Short Segment Mode Spread Test	meters ATBD Table 5-2	Threshold to test distance between short segment histogram multimodes against for inclusion or exclusion of short segment.
sub_max COMPACT	FLOAT (1)	Subsurf Max Vertical Profile	meters ATBD Table 5-2	Maximum vertical profile of water subsurface to include in estimation of subsurface characteristics
type_to_process COMPACT	INTEGER_1 (9)	Type to Process	1 ATL13 ATBD, Section 4.7.1.2, Table 5-4	Water body types that are to be processed by the ATL13 algorithm. This parameter is a rank 1 array of extent 9, with the body type digits coinciding with the array subscripts 1 through 9. Array elements are binary values, if 0 then process body type, 1 otherwise. Water body types are described in ATL13 chapter 4.7.1.2 and in Table 5-4. Flag Values: ['0', '1'] Flag Meanings: ['process_type', 'otherwise']
Group: /gtx				
Description	(Attribute)	Contains per-beam data products.		
data_rate	(Attribute)	Data within this group are stored at the inland water short segment rate (/ancillary_data/inland_water/s_seg2).		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
atl13refid CHUNKED	INTEGER_8 (:)	ATL13 Reference ID	1 ATL13 ATBD, Section 5.3.1 (C)	Unique aggregate reference number for each shape in the ATL13 Inland Water Body Mask, where digit 1 = type, digit 2 = size, digit 3 = source, and digits 4-10 = shape id
cloud_flag_asr_atl09 CHUNKED	INTEGER_1 (:)	Cloud Flag ASR	1 ATL13 ATBD, Section 5.3.5 (A)	Cloud probability from ASR. Flag Values: ['0', '1', '2', '3', '4', '5'] Flag Meanings: ['clear', 'with', 'high', 'confidence', 'clear', 'with', 'medium', 'confidence', 'clear', 'with', 'low', 'confidence', 'cloudy', 'with', 'low', 'confidence', 'cloudy', 'with', 'medium', 'confidence', 'cloudy', 'with', 'high', 'confidence']
cloud_flag_atm_atl09 CHUNKED	INTEGER_1 (:)	Cloud Flag Atm	1 ATL13 ATBD, Section 5.3.5 (A)	Cloud flag from backscatter profile.
cycle CHUNKED	INTEGER_1 (:)	Cycle Number	counts ATL03	Tracks the number of 91-day cycles in the mission, beginning with 01.
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.
err_ht_water_surf CHUNKED	FLOAT (:)	Height Error	1 section 5.3.3 (C)	Error included in heights reported in ht_water_surf.
err_slope_trk CHUNKED	FLOAT (:)	Slope Error	1 section 5.3.3 (C)	Error included in segment_slope_trk_local.
ht_ortho CHUNKED	FLOAT (:)	Orthometric Height	meters ATL13 ATBD, Section 5.3.5 (A)	Orthometric height EGM2008 converted from ellipsoidal height.
ht_water_surf CHUNKED	FLOAT (:)	Water surface height	meters ATL13 ATBD, Section 5.3.5 (A)	Water surface height, reported for each short segment (default length = approximately 100 signal photons) with reference to WGS84 ellipsoid
ice_flag CHUNKED	INTEGER_1 (:)	Ice Flag	1 section 5.3.2 (D)	Flag indicating significant existence of ice on the water surface Flag Values: ['0', '1'] Flag Meanings: ['no_ice', 'ice']
inland_water_body_id CHUNKED	INTEGER (:)	Body ID	1 ATL13 ATBD, Section 5.3.1 (C)	Identifying signature of an individual inland water body. Each body of water is represented by a unique numeric value.
inland_water_body_region CHUNKED	INTEGER (:)	Body region	1 ATL13 ATBD, Section 5.3.1 (A)	ATL13-created shapefile representing relevant bodies of water over which to implement the ATL13 water surface finding algorithm only within a region of processing interest.
inland_water_body_size CHUNKED	INTEGER_1 (:)	Body size	1 ATL13 ATBD, Section 5.3.1 (C)	Size of Inland Water Body, A=area, where 0=Not_Assigned, 1=A>10,000 sq km, 2=10,000>A>=1,000, 3=1,000>A>=100, 4=100>A>=10, 5=10>A>=1, 6=1>A>=0.1, 7=0.01>A, 8=Reserved, 9=Reserved Flag Values: ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9'] Flag Meanings: ['Not', 'Assigned', 'A>10,000', 'sq', 'km', '10,000>A>=1,000', '1,000>A>=100', '100>A>=10', '10>A>=1', '1>A>=0.1', '0.01>A', 'Reserved', 'Reserved']
inland_water_body_source CHUNKED	INTEGER_1 (:)	Body source	1 ATL13 ATBD, Section 5.3.1 (C)	Source of Inland Water Body shape, where 1=HydroLAKES, 2=Global Lakes and Wetlands Database, 3=Named Marine Water Bodies, 4=GSHHG Shoreline, 5=Global River Widths from Landsat, 6=Reserved, 7=Reserved, 8=Reserved, 9=Reserved Flag Values: ['1', '2', '3', '4', '5', '6', '7', '8', '9'] Flag Meanings: ['HydroLAKES', 'Global_Lakes_and_Wetlands_Database', 'Named_Marine_Water_Bodies', 'GSHHG_Shoreline', 'Global', 'River', 'Widths', 'from', 'Landsat', 'Reserved', 'Reserved', 'Reserved', 'Reserved']
inland_water_body_type CHUNKED	INTEGER_1 (:)	Body type	1 ATL13 ATBD, Section 5.3.1 (C)	Type of Inland Water Body, where 1=Lake, 2=Known Reservoir, 3=(Reserved for future use), 4=Ephemeral Water, 5=River, 6=Estuary or Bay, 7=Coastal Water, 8=Reserved, 9=Reserved Flag Values: ['1', '2', '3', '4', '5', '6', '7', '8', '9'] Flag Meanings: ['Lake', 'Known_Reservoir', 'Reserved_for_future_use', 'Ephemeral_Water', 'River', 'Estuary_or_Bay', 'Coastal_Water', 'Reserved', 'Reserved']
layer_flag_atl09 CHUNKED	INTEGER_1 (:)	Consolidated cloud flag	1 ATL13 ATBD, Section 5.3.5 (A)	Consolidated cloud flag. Flag Values: ['0', '1'] Flag Meanings: ['likely', 'clear', 'likely', 'cloudy']
met_ts_atl09 CHUNKED	FLOAT (:)	Surface temperature temperature	K ATL13 ATBD, Section 5.3.5 (A)	Surface (skin) temperature from ATL09.

met_wind10_atl09 CHUNKED	FLOAT (:)	Wind speed magnitude at 10m Wind speed	m/s ATL13 ATBD, Section 5.3.5 (A)	Wind speed magnitude at 10m height from ATL09 input.
met_wind10_atl13 CHUNKED	FLOAT (:)	Wind speed magnitude at 10m Wind speed	m/s ATL13 ATBD, Section 5.3.5 (A)	Wind speed magnitude at 10m height, based on derived water surface wave height.
qf_bckgrd CHUNKED	INTEGER (:)	Background Quality Flag	1 Inland Water ATBD	Describes the degree of background photons present in each short segment. bckgrd_dnsty_threshold1= 0.001 (counts per bi per Lseg); bckgrd_dnsty_threshold2= 0.01 (counts per bin per Lseg); bckgrd_dnsty_threshold3= 0.05 (counts per bin per Lseg); bckgrd_dnsty_threshold4= 0.1 (counts per bin per Lseg); bckgrd_dnsty_threshold5= 0.3 (counts per bin per Lseg); bckgrd_dnsty_threshold6= 0.5 (counts per bin per Lseg) Flag Values: ['0', '1', '2', '3', '4', '5', '6'] Flag Meanings: ['equal_to_or_below_threshold1', 'equal_to_or_below_threshold2', 'equal_to_or_below_threshold3', 'equal_to_or_below_threshold4', 'equal_to_or_below_threshold5', 'equal_to_or_below_threshold6', 'above_threshold6']
qf_bias_em CHUNKED	INTEGER (:)	EM Bias Quality Flag	1 Inland Water ATBD	The Electromagnetic Bias flag is set based on threshold checks for the estimated electromagnetic height bias. The flag is set as follows: -3 if $H\_bias\_EM < -0.10$ (m); -2 if $-0.10 < H\_bias\_EM < -0.05$; -1 if $-0.05 <= H\_bias\_EM < -0.01$; 0 if $-0.01 <= H\_bias\_EM < 0.01$ (m); 1 if $0.01 <= H\_bias\_EM < 0.05$; 2 if $0.05 <= H\_bias\_EM < 0.10$; 3 if $0.10 < H\_bias\_EM$; 4 if H_bias_EM is invalid. Flag Values: ['-3', '-2', '-1', '0', '1', '2', '3', '4'] Flag Meanings: ['below_threshold1', 'below_threshold2', 'below_threshold3', 'below_threshold4', 'below_threshold5', 'below_threshold6', 'above_threshold6', 'invalid']
qf_bias_fit CHUNKED	INTEGER (:)	Height Bias Fit Quality Flag	1 Inland Water ATBD	The height bias fit flag is set based on the value of the goodness of fit bias estimated as the difference between the centroid elevations of the observed surface water histogram and fitted integrated water surface model histogram. The flag values are set as follows: = -3 if $H\_bias\_fit < -0.10$ (m); -2 if $-0.10 <= H\_bias\_fit < -0.05$;-1 when $-0.05 <= H\_bias\_fit < -0.01$; 0 if $-0.01 <= H\_bias\_fit < 0.01$ (m); 1 if $0.01 <= H\_bias\_fit < 0.05$; 2 if $0.05 < H\_bias\_fit < 0.10$; 3 if $0.10 <= H\_bias\_fit$; 4 if H_bias_fit is invalid. Flag Values: ['-3', '-2', '-1', '0', '1', '2', '3', '4'] Flag Meanings: ['below_threshold1', 'below_threshold2', 'below_threshold3', 'below_threshold4', 'below_threshold5', 'below_threshold6', 'equal_to_or_above_threshold6', 'invalid']
qf_cloud CHUNKED	INTEGER (:)	Consolidated cloud flag	1 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. From the ATL09 data closest to the segment time. Flag Values: ['0', '1'] Flag Meanings: ['likely_clear', 'likely_cloudy']
qf_ice CHUNKED	INTEGER (:)	Ice Quality Flag	1 Inland Water ATBD	The quality flag for ice describes the likelihood of ice on the short water body surface segment. 0 for QF_Bckgrd<= 2; 1 for 2 < QF_Bckgrd<= 4; 2 for 4 < QF_Bckgrd; 3 for (4 < QF_Bckgrd and QF_Cloud=1) Flag Values: ['0', '1', '2', '3']

				Flag Meanings: ['qf_bckgrd_le_2', 'qf_bckgrd_le_4', 'qf_bckgrd_gt_4', 'qf_bckgrd_w_cloud']
qf_iwp CHUNKED	INTEGER (:)	Inland Water Segment Processing Flag	Inland Water ATBD	Inland Water segment Processing (IWP) flag to describe the level of processing the inland water algorithm was able to perform on each short segment based on the data available, ranging from 1 to 7. Flag Values: ['1', '2', '3', '4', '5', '6', '7'] Flag Meanings: ['1_short_segment', '2_short_segments', '3_to_5_short_segments', '6_to_7_short_segments', '8_to_9_short_segments', '10_to_29_short_segments', '30_or_more_short_segments_analyzed']
qf_lseg_length CHUNKED	INTEGER (:)	Long Segment Length flag	1 Inland Water ATBD	The Long Segment Length flag is set based on the length of the long segment. The flag is set as follows: 0 if Lseg_length < 500 (meters); 1 if 50 <= Lseg_length < 1500 (meters); 2 if 150 <= Lseg_length < 3000 (meters); 3 if 3000 <= Lseg_length Flag Values: ['0', '1', '2', '3'] Flag Meanings: ['below_threshold1', 'below_threshold2', 'below_threshold3', 'above_threshold4']
qf_spec_width CHUNKED	INTEGER (:)	Spectral Width Flag	1 Inland Water ATBD	The Spectral Width flag is set based on threshold checks for the estimated Spectral Width. The flag is set as follows: 0 if spec_width < 0.5; 1 if spec_width >= +0.5. Flag Values: ['0', '1'] Flag Meanings: ['below_0.5', 'above_0.5']
qf_sseg_length CHUNKED	INTEGER (:)	Short Segment Length flag	1 Inland Water ATBD	The Short Segment Length flag is set based on the length of the short segment. The flag is set as follows: 0 if sseg_length< 50 (meters); 1 if 50 Flag Values: ['0', '1', '2', '3'] Flag Meanings: ['below_threshold1', 'below_threshold2', 'below_threshold3', 'above_threshold4']
qf_subsurf_anomaly CHUNKED	INTEGER (:)	Subsurface Anomaly Quality Flag	1 Inland Water ATBD 5.3.4(A)	Describes the likelihood that the bottom or other subsurface anomaly is bottom based on the threshold value at which an anomaly was found. 1 = Subsurface anomaly due to bottom likely; 2 = Subsurface signal may indicate bottom or other anomaly; 3 = Possible subsurface anomaly; invalid = No subsurface anomaly detected Flag Values: ['1', '2', '3'] Flag Meanings: ['bottom_likely', 'bottom_or_other_anomaly', 'possible_subsurface_anomaly']
rgt CHUNKED	INTEGER_2 (:)	Reference Ground track	1 ATL03	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_azimuth CHUNKED	FLOAT (:)	Azimuth azimuth	radians ATL13 ATBD, Section 5.3.5 (A)	The direction, eastwards from north, of the laser beam vector as seen by an observer at the laser ground spot viewing toward the spacecraft (i.e., the vector from the ground to the spacecraft). When the spacecraft is precisely at the geodetic zenith, the value will be 99999 degrees.
segment_dac CHUNKED	FLOAT (:)	Segment DAC	meters ATBD Section 5.3.5A	Dynamic atmospheric correction (DAC) includes inverted barometer (IB) effect (+- 5 cm). Although available at short segment rate for all water body types, value is provided mainly for transitional tidal and coastal water (types 6 and 7) and the largest lakes of Type 1 (~> 10,000 km2) for user's discretion.
segment_fpb_correction CHUNKED	DOUBLE (:)	First photon bias correction	meters ATL13 ATBD, Section 5.3.5 (A)	First photon bias correction. May be applied at user disrection by subtracting from mean height produts ht_ortho and ht_water_surf.
segment_geoid	FLOAT	Segment Geoid	meters	Applicable geoid value at reporting location for all short

CHUNKED	(:)		ATL03	segment statistics.
segment_id_beg CHUNKED	INTEGER (:)	First ATL03 Segment ID	1 ATL03	First ATL03 segment_id associated with the photons within this inland water segment.
segment_id_end CHUNKED	INTEGER (:)	Last ATL03 Segment ID	1 ATL03	Last ATL03 segment_id associated with the photons within this inland water segment.
segment_lat CHUNKED	DOUBLE (:)	Latitude latitude	degrees ATL13 ATBD, Section 5.3.5 (A)	Latitude of reporting location for all short segment statistics.
segment_lon CHUNKED	DOUBLE (:)	Longitude longitude	degrees ATL13 ATBD, Section 5.3.5 (A)	Longitude of reporting location for all short segment statistics.
segment_slope_trk_bdy CHUNKED	FLOAT (:)	Water Body Slope	1 section 5.3.5 (A)	Along track water body surface slope.
segment_tide_equilibrium CHUNKED	FLOAT (:)	Segment Tide Equilibrium	meters ATL03	Long period equilibrium tide self-consistent with ocean tide model (+- 0.04 m). Although available at short segment rate for all water body types, value is provide mainly for transitional tidal and coastal water (types 6 and 7) and the largest lakes of Type 1 (~> 10,000 km2) for user's discretion.
segment_tide_ocean CHUNKED	FLOAT (:)	Segment Tide Ocean	meters ATL03	Ocean tides including diurnal and semi-diurnal (harmonic analysis (+-4 m)). Although available at short segment rate for all water body types, value is provide mainly for transitional tidal and coastal water (types 6 and 7) and the largest lakes of Type 1 (~> 10,000 km2) for user's discretion.
significant_wave_ht CHUNKED	FLOAT (:)	SWH	meters section 5.3.3 (C)	Significant wave height
snow_ice_atl09 CHUNKED	INTEGER (:)	Snow Ice Flag	1 ATL13 ATBD, Section 5.3.5 (A)	NOAA snow/ice flag scaled by ATL09 (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']
sseg_end_lat CHUNKED	DOUBLE (:)	End latitude latitude	degrees ATL13 ATBD, Section 5.3.2 (C)	Latitude at which the short segment ends. May be a signal or non-signal photon.
sseg_end_lon CHUNKED	DOUBLE (:)	End longitude longitude	degrees ATL13 ATBD, Section 5.3.2 (C)	Longitude at which the short segment ends. May be a signal or non-signal photon.
sseg_mean_lat CHUNKED	DOUBLE (:)	Mean latitude latitude	degrees ATL13 ATBD, Section 5.3.5 (A)	Mean latitude of the signal-qualified photons in a short segment.
sseg_mean_lon CHUNKED	DOUBLE (:)	Mean longitude longitude	degrees ATL13 ATBD, Section 5.3.5 (A)	Mean longitude of the signal-qualified photons in a short segment.
sseg_mean_time CHUNKED	DOUBLE (:)	Mean time time	Seconds since 2018-01-01 ATL13 ATBD, Section 5.3.5 (A)	Mean time of the signal-qualified photons in a short segment.
sseg_start_lat CHUNKED	DOUBLE (:)	Start latitude latitude	degrees ATL13 ATBD, Section 5.3.2 (C)	Latitude at which the short segment begins. May be a signal or non-signal photon.
sseg_start_lon CHUNKED	DOUBLE (:)	Start longitude longitude	degrees ATL13 ATBD, Section 5.3.2 (C)	Longitude at which the short segment begins. May be a signal or non-signal photon.
stdev_water_surf CHUNKED	FLOAT (:)	Surface StDev	meters section 5.3.3 (C)	Standard deviation of water surface, calculated over long segments with result reported at each short segment location tag contained within.
subsurface_attenuation CHUNKED	FLOAT (:)	Subsurface Attenuation	1 section 5.3.4 (A)	Subsurface attenuation coefficient.

transect_id CHUNKED	INTEGER_1 (:)	Transect ID	1 ATL13 ATBD, Section 5.3.2 (C)	Transect within a water body to which the short segment rate output belongs.
water_depth CHUNKED	FLOAT (:)	Water depth	meters ATL13 ATBD, Section 5.3.4 (A)	Depth from the mean water surface to detected bottom.

Group: /multibeam				
Description	(Attribute)	Contains Multi-Beam Water Height Data Products		
data_rate	(Attribute)	Data within this group are stored per inland water body (where data availability permits).		
Label (Layout)	Datatype (Dimensions)	long_name (standard_name)	units source	description
aspect CHUNKED	FLOAT (:)	Aspect	radians section 5.3.5 (B)	Direction of slope of planar surface with respect to North between adjacent strong beams.
cycle CHUNKED	INTEGER_1 (:)	Cycle Number	counts ATL03	Tracks the number of 91-day cycles in the mission, beginning with 01.
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.
err_aspect CHUNKED	FLOAT (:)	Error in Aspect	radians section 5.3.5 (C)	Error included in aspect reported.
err_slope_bdy CHUNKED	FLOAT (:)	Error in Slope	1 section 5.3.5 (C)	Error included in segment_slope_trk_bdy.
inland_water_basin_id CHUNKED	INTEGER (:)	Basin ID	1 section 5.3.1 (A)	Identifying signature of an individual inland water basin. Each basin is represented by a unique numeric value.
inland_water_body_id CHUNKED	INTEGER (:)	Body ID	1 ATL13 ATBD, Section 5.3.1 (C)	Identifying signature of an individual inland water body. Each body of water is represented by a unique numeric value.
max_slope CHUNKED	FLOAT (:)	Maximum Slope	1 section 5.3.5 (B)	Maximum slope of planar triangular surface between adjacent strong beams.
plan_lat CHUNKED	DOUBLE (:)	Latitude latitude	degrees_north section 5.3.5 (B)	Latitude of reporting location for multi-beam planar statistics
plan_lon CHUNKED	DOUBLE (:)	Longitude longitude	degrees_east section 5.3.5 (B)	Longitude of reporting location for multi-beam planar statistics
rgt CHUNKED	INTEGER_2 (:)	Reference Ground track	1 ATL03	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 (:)	First ATL03 Segment ID	1 ATL03	First ATL03 segment_id associated with the photons within this inland water segment.
segment_id_end CHUNKED	INTEGER (:)	Last ATL03 Segment ID	1 ATL03	First ATL03 segment_id associated with the photons within this inland water segment.

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 failure; 2=insufficient data; 3=TBD3; 4=TBD4; 5=TBD5 Flag Values: ['0', '1', '2', '3', '4', '5'] Flag Meanings: ['no_failure', 'processing_failure', 'insufficient_data', 'TBD3', 'TBD4', 'TBD5']
qa_granule_pass_fail	INTEGER	Granule Pass	1	Flag indicating granule quality. 0=granule passes automatic

COMPACT	(1)	Flag	Operations	QA. 1=granule fails automatic QA. Flag Values: ['0', '1'] Flag Meanings: ['PASS', 'FAIL']