ATL09 Product Data Dictionary

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description	(Attribute)	This data set (ATL09) contains calibrated, attenuated backscatter profiles, layer integrated attenuated backscatter, and other parameters including cloud layer height and atmospheric characteristics obtained from the data. The data were acquired by the Adv
level	(Attribute)	L3A
short_name	(Attribute)	ATL09
title	(Attribute)	SET_BY_META
Group: /		This data set (ATL09) contains calibrated, attenuated backscatter profiles, layer integrated attenuated backscatter, and other parameters including cloud layer height and atmospheric characteristics obtained from the data. The data were acquired by the Adv
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
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)	ATL09
hdfversion	(Attribute)	SET_BY_PGE
history	(Attribute)	SET_BY_PGE
identifier_file_uuid	(Attribute)	SET_BY_PGE
identifier_product_doi	(Attribute)	10.5067/ATLAS/ATL09.001
identifier_product_doi_authority	(Attribute)	http://dx.doi.org
identifier_product_format_version	(Attribute)	SET_BY_PGE
identifier_product_type	(Attribute)	ATL09
institution	(Attribute)	SET_BY_META
instrument	(Attribute)	SET_BY_META
keywords	(Attribute)	SET_BY_META
keywords_vocabulary	(Attribute)	SET_BY_META
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		
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		
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'])
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)
qa_at_interval COMPACT	DOUBLE([1])	QA Along-Track Interval None	1	Statistics time interval for along-track QA data. (Source: control)
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 COMPACT	DOUBLE([1])	Start GPS SOW of Granule (Actual) None	seconds	GPS seconds-of-week of the first 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/atmosphere		Contains general ancillary parameters.		
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
a_m1 COMPACT	FLOAT([3])	a_m1 None	meters	a_m, anisotropy factor, to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
a_m2 COMPACT	FLOAT([3])	a_m2 None	meters	a_m, anisotropy factor, to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
aclr_use_atlas COMPACT	INTEGER([1])	ALR Use ATLAS Flag None	1	Flag to control the computation of the aclr_true parameter.

				(Source: Operations); (Meanings: [0 1]) (Values: ['non_water_uses_gnome' 'non_water_uses_ATLAS_ASR'])
alpha_day_pce1 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Day PCE1 None	1	Molecular Folding Scaling Factor (PCE1/day) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_day_pce2 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Day PCE2 None	1	Molecular Folding Scaling Factor (PCE2/day) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_day_pce3 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Day PCE3 None	1	Molecular Folding Scaling Factor (PCE3/day) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_night_pce1 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Night PCE1 None	1	Molecular Folding Scaling Factor (PCE1/night) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_night_pce2 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Night PCE2 None	1	Molecular Folding Scaling Factor (PCE2/night) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_night_pce3 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Night PCE3 None	1	Molecular Folding Scaling Factor (PCE3/night) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_twilight_pce1 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Twilight PCE1 None	1	Molecular Folding Scaling Factor (PCE1/twilight) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_twilight_pce2 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Twilight PCE2 None	1	Molecular Folding Scaling Factor (PCE2/twilight) (Source: Atmosphere ATBD, part 1, section 3.3.2)
alpha_twilight_pce3 COMPACT	FLOAT([1])	Molecular Folding Scaling Factor Twilight PCE3 None	1	Molecular Folding Scaling Factor (PCE3/twilight) (Source: Atmosphere ATBD, part 1, section 3.3.2)
asr_cal_factor COMPACT	FLOAT([1])	ASR CAL factor None	1	Calibration factor for ASR computation (Source: Atmosphere ATBD)
atlas_bandpass_fw COMPACT	FLOAT([1])	ATLAS Bandpass Filter Width None	nm	The ATLAS bandpass filter width. (Source: Atmosphere ATBD)
atlas_tele_fov COMPACT	FLOAT([1])	ATLAS Telescope Field of View None	radians	The ATLAS telescope field of view. (Source: Atmosphere ATBD)
backg_max_solar_elev COMPACT	FLOAT([1])	Background maximum solar elevation angle None	degrees	Background maximum solar elevation angle in Method 1 bkgd comp (Source: Atmosphere ATBD section 3.3.4)
backg_min_solar_elev COMPACT	FLOAT([1])	Background minimum solar elevation angle None	degrees	Background minimum solar elevation angle in Method 1 bkgd comp (Source: Atmosphere ATBD section 3.3.4)
backg_select COMPACT	INTEGER([1])	background method used None	1	The background method used in calculation of NRB (Source: Atmosphere ATBD section 3.3.4); (Meanings: [1 2 3]) (Values:

				['method1' 'method2' 'method3'])
bs_extinc_backs COMPACT	FLOAT([1])	Blowing Snow to Extinction Backscatter Ratio None	sr	blowing snow extinct to backscatter ratio (Source: Atmosphere ATBD)
bs_lay_max_size COMPACT	FLOAT([1])	blowing snow maximum layer size None	m	blowing snow maximum layer size (Source: Atmosphere ATBD)
bs_thresh_scale COMPACT	FLOAT([1])	scale factor for blowing snow threshold None	1	scale factor for blowing snow threshold (Source: Atmosphere ATBD)
bs_top_scale COMPACT	FLOAT([1])	scale factor for layer top threshold None	1	scale factor for layer top threshold (Source: Atmosphere ATBD)
bs_wind_thres COMPACT	FLOAT([1])	scale factor for layer top threshold None	m/s	minimum windspeed for blowing snow (Source: Atmosphere ATBD)
cal_bot_ht COMPACT	FLOAT([1])	cal_bot_ht None	m	Bottom height of calibration zone (m) (Source: Atmosphere ATBD)
cal_default COMPACT	FLOAT([1])	Default calibration value None	1	Calibration constant default if it cannot be calculated from the data. (Source: Atmosphere ATBD)
cal_lat_bound COMPACT	DOUBLE([1])	cal_lat_bound None	degrees_north	Calibration constant latitude bound (deg_north) (Source: Atmosphere ATBD)
cal_select COMPACT	INTEGER([1])	calibration method used None	1	The calibration method used in calculation of NRB (Source: Atmosphere ATBD section 3.3.4); (Meanings: [1 2 3]) (Values: ['method1' 'method2' 'method3'])
cal_top_ht COMPACT	FLOAT([1])	cal_top_ht None	m	Top height of calibration zone (m) (Source: Atmosphere ATBD)
cld_aer_discrim_thresh COMPACT	FLOAT([1])	cloud aerosol discrimination threshold None	1	Adjustable threshold for determining whether a layer is cloud, aerosol, or unknown. (Source: Atmosphere ATBD)
cutoff1 COMPACT	FLOAT([3])	cutoff1 None	1	cutoff to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
cutoff2 COMPACT	FLOAT([3])	cutoff2 None	1	cutoff to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
demtol1 COMPACT	INTEGER([1])	DEM tolerance for mask 1 None	bins	DEM tolerance for mask 1 in DDA surface finding (Source: Atmosphere ATBD)
demtol2 COMPACT	INTEGER([1])	DEM tolerance for mask 2 None	bins	DEM tolerance for mask 2 in DDA surface finding (Source: Atmosphere ATBD)
detector_efficiency COMPACT	FLOAT([1])	Detector Quantum Efficiency None	1	Detector quantum efficiency (Qe) (Source: Atmosphere ATBD)
downsample1 COMPACT	FLOAT([3])	downsample1 None	bins	downsample to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
downsample2 COMPACT	FLOAT([3])	downsample2 None	bins	downsample to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
dtime_select COMPACT	INTEGER([1])	dead time factor used None	1	Deadtime factor used. (Source: Control); (Meanings: [1 2]) (Values: ['dtime_fact1' 'dtime_fact2'])

layer_flag_cp1 COMPACT	INTEGER([1]) 	Layer Flag CP 1 None	1	Cloud_flag_ASR value used in the computation of the consolidated layer flag during daytime when cloud layers were detected. (Source: Atmosphere ATBD)
layer_flag_cp2 COMPACT	INTEGER([1]) 	Layer Flag CP 2 None	1	Cloud_flag_ASR value used in the computation of the consolidated layer flag during daytime when no cloud layers were detected. (Source: Atmosphere ATBD)
layer_sep COMPACT	INTEGER([1]) 	minimum layer separation None	bins	minimum layer separation (Source: Atmosphere ATBD)
layer_thick COMPACT	INTEGER([1]) 	minimum layer thickness None	bins	minimum layer thickness (Source: Atmosphere ATBD)
lr_bsnow_fac CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Low rate blowing snow factor None	1	Low rate blowing snow scaling factor (Source: Atmosphere ATBD)
max_bsnow_cab COMPACT	FLOAT([1]) 	Maximum CAB for blowing snow None	1/m-sr	Maximum CAB for blowing snow (Source: Atmosphere ATBD)
max_layers COMPACT	INTEGER([1]) 	maximum cloud layers for a profile None	bins	maximum cloud layers for a profile (Source: Atmosphere ATBD)
min_layer_sep COMPACT	INTEGER([1]) 	mInimum layer separation conf None	bins	Minimum layer separation for DDA confidence (Source: Atmosphere ATBD, part 2)
neighborhood1 COMPACT	FLOAT([1]) 	neighborhood1 None	bins	neighborhood to use for pass 1 (Source: Atmosphere ATBD)
neighborhood2 COMPACT	FLOAT([1]) 	neighborhood2 None	bins	neighborhood to use for pass 2 (Source: Atmosphere ATBD)
normalization1 COMPACT	INTEGER_1([1]) 	normalization1 None	1	normalization flag to use for pass 1 (Source: Atmosphere ATBD); (Meanings: [0 1]) (Values: ['true' 'false'])
normalization2 COMPACT	INTEGER_1([1]) 	normalization2 None	1	normalization flag to use for pass 2 (Source: Atmosphere ATBD); (Meanings: [0 1]) (Values: ['true' 'false'])
num_passes COMPACT	INTEGER_1([3]) 	number of passes None	1	Flag indicating if cloud detection algorithm does one pass or two passes (day, night, twilight) (Source: Atmosphere ATBD); (Meanings: [0 1]) (Values: ['one' 'two'])
phi_land COMPACT	FLOAT([1]) 	phi land None	1	Factor for correcting the potential clear sky ASR biases for land (Source: Atmosphere ATBD, part 1, section 4.6.2.3)
phi_ocean COMPACT	FLOAT([1]) 	phi ocean None	1	Factor for correcting the potential clear sky ASR biases for ocean (Source: Atmosphere ATBD, part 1, section 4.6.2.3)
planck_const COMPACT	DOUBLE([1]) 	Planck constant (h) None	Js	Planck constant (h) (Source: Atmosphere ATBD section 2)
proc_interval COMPACT	DOUBLE([1]) 	amount of data processed at one time None	s	amount of data processed at one time (Source: Atmosphere ATBD)
quantile1 COMPACT	FLOAT([3]) 	quantile1 None	1	quantile to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)

quantile2 COMPACT	FLOAT([3])	quantile2 None	1	quantile to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
receiver_optical_throughput COMPACT	FLOAT([1])	Receiver Optics Throughput None	1	Nominal Receiver Optics Throughput (Source: Atmosphere ATBD)
sigma1 COMPACT	FLOAT([3])	sigma1 None	meters	sigma to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
sigma2 COMPACT	FLOAT([3])	sigma2 None	meters	sigma to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
size_threshold1 COMPACT	FLOAT([3])	size_threshold1 None	bins	size_threshold, minimum cluster size, to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
size_threshold2 COMPACT	FLOAT([3])	size_threshold2 None	bins	size_threshold, minimum cluster size, to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
snow_age COMPACT	FLOAT([1])	Snow Age None	hours	Age of the snow on the ground. (Source: Atmosphere ATBD)
solar_flux COMPACT	FLOAT([1])	Solar Flux None	W/(m^2 nm))	Solar flux at the top of the atmosphere at 532nm. (Source: Atmosphere ATBD)
surf_min COMPACT	INTEGER([1])	minimum count for a surface type to be considered separate surface type None	counts	minimum count for a surface type to be considered separate surface type (Source: Atmosphere ATBD)
surface_signal_source COMPACT	INTEGER([1])	Signal Source Flag None	1	Indicates the source of signal information used by ASR. (Source: Atmosphere ATBD); (Meanings: [1 2]) (Values: ['use_atl04' 'use_atl03'])
telescope_area COMPACT	DOUBLE([1])	Telescope Effective Area None	sq meters	Effective collection area of telescope (At) (Source: Atmosphere ATBD)
thresh_bias1 COMPACT	FLOAT([3])	thresh_bias1 None	photons* square meter/Joule	thresh_bias to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
thresh_bias2 COMPACT	FLOAT([3])	thresh_bias2 None	photons* square meter/Joule	thresh_bias to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
thresh_sensitivity1 COMPACT	FLOAT([3])	thresh_sensitivity1 None	1	thresh_sensitivity to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
thresh_sensitivity2 COMPACT	FLOAT([3])	thresh_sensitivity2 None	1	thresh_sensitivity to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
threshold_segment_length1 COMPACT	FLOAT([3])	threshold_segment_length1 None	bins	threshold_segment_length to use for pass 1 (day, night, twilight) (Source: Atmosphere ATBD)
threshold_segment_length2 COMPACT	FLOAT([3])	threshold_segment_length2 None	bins	threshold_segment_length to use for pass 2 (day, night, twilight) (Source: Atmosphere ATBD)
Group: /orbit_info		Contains orbit information.		
data_rate	(Attribute)	Varies. Data are only provided when one of the stored values (besides time) changes.		
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	1	A count of the number of exact repeats of this reference orbit. (Source: Operations)
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	1	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. (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 time	seconds since 2018-01-01	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. (Source: POD/PPD)
Group: /profile_x		Each group contains the segments for the strong beam of one Pair 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. The Atmosphere profiles are only reported for the strong beam. Profiles are numbered from the left to the right in the direction of spacecraft travel as: 1 for the left-most pair of beams; 2 for the center pair of beams; and 3 for the right-most pair of beams.		
data_rate	(Attribute)	See subgroups for individual data rates.		
Group: /profile_x/bckgrd_atlas		Contains the ATLAS 50-shot background data and derivations.		
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'])	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)
pce_mframe_cnt CHUNKED	UINT_4_LE(['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 (Source: ATL02)
Group: /profile_x/high_rate		Contains parameters related to Calibrated Attenuated Backscatter at 25 hz		
data_rate	(Attribute)	Data in this group is stored at a 25hz (25 per second) rate.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
aclr_true CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Clear sky ASR None	1	Clear sky initial surface reflectance based on GOME climatology or Cox-Munk model: see Fig 3.6.5 of the Atmosphere ATBD. (Source: Atmosphere ATBD)
apparent_surf_reflec CHUNKED	FLOAT(['Unlimited'])	Apparent Surface Reflectance None	1	Apparent Surface Reflectance (ASR): Eqn 4.7 (Source: Atmosphere ATBD)
asr_cloud_probability CHUNKED	INTEGER(['Unlimited'])	ASR cloud probablity None	1	Probability of the occurrence of cloud based on the magnitude of the apparent surface reflectivity. (Source: Atmosphere ATBD part 1 (section 4.6.2.3))
backg_c CHUNKED	FLOAT(['Unlimited'])	Background None	counts	Background, in photons/bin, used in the NRB Computation. (Source: Atmosphere ATBD)
backg_theoret CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Background (Theoretical) None	photons/bin	The theoretical background, in photons/bin. (Source: Atmosphere ATBD)
beam_azimuth CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	beam azimuth None	degrees_east	Beam azimuth (Source: ATL03 ATBD)
beam_elevation CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	beam elevation None	degrees	Beam elevation (Source: ATL03 ATBD)
bsnow_con CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Blowing snow confidence None	1	Blowing snow confidence. -3=surface not detected; -2=no surface wind;-1=no scattering layer found; 0=no top layer found; 1=none-little; 2=weak; 3=moderate; 4=moderate-high; 5=high; 6=very high (Source: Atmosphere ATBD); (Meanings: [-3 -2 -1 0 1 2 3 4 5 6]) (Values: ['surface_not_detected' 'no_surface_wind' 'no_scattering_layer_found' 'no_top_layer_found' 'none_little' 'weak' 'moderate' 'moderate_high'

				'high' 'very_high'])
bsnow_dens CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing snow density None	1	Blowing snow layer density (Source: Atmosphere ATBD)
bsnow_h CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing Snow layer thickness None	meters	Blowing Snow layer thickness (height of top above surface) (Source: Atmosphere ATBD)
bsnow_h_dens CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing Snow layer thickness from density None	meters	Blowing Snow layer thickness from density (height of top above surface) (Source: Atmosphere ATBD)
bsnow_intensity CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing snow intensity None	meters/second	Blowing snow intensity defined as the average scattering ratio within the blowing snow layer times the 10 m wind speed. (Source: Atmosphere ATBD part I (section 4.5.3))
bsnow_od CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing snow OD None	1	Blowing snow layer optical depth (Source: Atmosphere ATBD)
bsnow_psc CHUNKED	INTEGER_1(['Unlimited'])	Blowing snow PSC flag None	1	Blowing snow PSC flag. Indicates the potential for polar stratospheric clouds to affect the blowing snow retrieval, where 0=none and 3=maximum. This flag is a function of month and hemisphere and is only applied poleward of 60 north and south. (Source: Atmosphere ATBD Section 4.5); (Meanings: [0 1 2 3]) (Values: ['none' 'slight' 'moderate' 'maximum_bsnow_PSC_affected'])
cab_prof CHUNKED	FLOAT(['Unlimited', 700]) INVALID_R4B	Calibrated Attenuated Backscatter None	1	Calibrated Attenuated Backscatter from 20 to -1 km with vertical resolution of 30m (eqn 4.1) (Source: Atmosphere ATBD)
cloud_flag_asr CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Cloud Flag ASR None	1	Cloud flag (probability) from apparent surface reflectance. 0=clear with high confidence; 1=clear with medium confidence; 2=clear with low confidence; 3=cloudy with low confidence; 4=cloudy with medium confidence; 5=cloudy with high confidence (Source: Atmosphere ATBD); (Meanings: [0 1 2 3 4 5]) (Values: ['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 CHUNKED	INTEGER_1(['Unlimited'])	Cloud Flag Atm None	1	Number of layers found from the backscatter profile using the DDA layer finder. (Source: Atmosphere ATBD)
cloud_fold_flag CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Cloud Folding Flag None	1	Flag that indicates this profile likely contains cloud signal folded down from above 15 km to the last 2-3 km of the profile. See ATBD Table 3.9 for detailed flag value meanings (Source: Atmosphere ATBD); (Meanings: [0 1 2 3]) (Values: ['no_folding' 'goes5_indicates' 'profile_indicates' 'both_indicate'])
column_od_asr	FLOAT(['Unlimited'])	Optical depth from ASR	1	Optical depth of atmosphere column

CHUNKED	INVALID_R4B	None		based on apparent surface reflectance and the assumed actual surface reflectance. (Source: Atmosphere ATBD)
column_od_asr_qf CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Optical depth ASR quality None	1	Total column optical depth from ASR quality flag. The total atmosphere column particulate optical depth can be computed from the apparent surface reflectance if the actual surface reflectance is well known. The flag indicates the surface type over which the flag is computed in the order from unable to compute (0 - no_surface_signal) to best quality (4=water). (Source: Atmosphere ATBD); (Meanings: [0 1 2 3 4]) (Values: ['no_signal' 'land' 'sea_ice' 'land_ice' 'water'])
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: Atmosphere ATBD)
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: Atmosphere ATBD); (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 (in priority of Arctic/Antarctic/Global/MSS) value at the geolocation point. (Source: Atmosphere ATBD)
density_pass1 CHUNKED	FLOAT(['Unlimited', 700]) INVALID_R4B	Density profile - pass1 None	1	Density profiles from pass 1. (Source: Atmosphere ATBD Part II)
density_pass2 CHUNKED	FLOAT(['Unlimited', 700]) INVALID_R4B	Density profile - pass2 None	1	Density profiles from pass 2. (Source: Atmosphere ATBD Part II)
ds_layers COMPACT	INTEGER([10])	Cloud Layers Dimension Scale None	counts	Dimension scale indexing the cloud layers. (Source: Atmosphere ATBD)
ds_va_bin_h COMPACT	FLOAT([700])	VA Bin Height Dimension Scale None	meters	Dimension scale containing the heights of the vertically-aligned bins. (Source: Atmosphere ATBD)
dtime_fac1 CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	dead_time_factor1 None	1	Dead time correction factor for surface signal computed from radiometric lookup table. (Source: Atmosphere ATBD)
dtime_fac2 CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	dead_time_factor2 None	1	Dead time correction factor for surface signal computed from ATBD equation 2.1. (Source: Atmosphere ATBD)

latitude CHUNKED	DOUBLE(['Unlimited'])	Latitude of the ATM histogram latitude	degrees_north	Latitude at the the top of the ATM histogram, WGS84, North=+, Derived from the geolocation of the ATM range window. (Source: ATL03g ATBD)
layer_attr CHUNKED	INTEGER_1(['Unlimited', 10])	Layer attribute flag None	1	Layer attribute flag for each of the possible 10 layers. Indicates (0) no_layer (1) cloud, (2) aerosol or (3) unknown. (Source: Atmosphere ATBD); (Meanings: [0 1 2 3]) (Values: ['no_layer' 'cloud' 'aerosol' 'unknown'])
layer_bot CHUNKED	FLOAT(['Unlimited', 10]) INVALID_R4B	Height layer bottoms None	meter	Height of bottom of detected layers (Source: Atmosphere ATBD)
layer_con CHUNKED	INTEGER(['Unlimited', 10]) INVALID_I4B	Layer confidence flag None	1	Layer confidence flag for each layer (Source: Atmosphere ATBD)
layer_conf_dens CHUNKED	FLOAT(['Unlimited', 10]) INVALID_R4B	Layer confidence from density None	1	The measure layer confidence from density-dimension algorithm is calculated for each detected cloud layer, quantifies the confidence of detection of a given layer from the density values. Layer_conf_dens fall between zero and 1. Confidence close to 1 is high, close to zero is low. (Source: Atmosphere ATBD Part II, Section 11)
layer_dens CHUNKED	FLOAT(['Unlimited', 10])	Layer Density None	1	Layer Density (Source: Atmosphere ATBD)
layer_flag CHUNKED	INTEGER_1(['Unlimited'])	Consolidated cloud flag None	1	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. (Source: Atmosphere ATBD); (Meanings: [0 1]) (Values: ['likely_clear' 'likely_cloudy'])
layer_ib CHUNKED	FLOAT(['Unlimited', 10]) INVALID_R4B	Layer integrated backscatter None	1	Layer integrated backscatter (Source: Atmosphere ATBD)
layer_top CHUNKED	FLOAT(['Unlimited', 10]) INVALID_R4B	Height layer tops None	meters	Height of top of detected layers (Source: Atmosphere ATBD)
longitude CHUNKED	DOUBLE(['Unlimited'])	Longitude of the ATM histogram longitude	degrees_east	Longitude at the the top of the ATM histogram, WGS84, East=+, derived from the geolocation of the ATM range window. (Source: ATL03g ATBD)
msw_flag CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Multiple Scattering Warning Flag None	1	Multiple Scattering warning flag. The multiple scattering warning flag (ATL09 parameter msw_flag) has values from -1 to 5 where zero means no multiple scattering and 5 the greatest. If no layers were detected, then msw_flag = 0. If blowing snow is detected and its estimated optical depth is greater than or equal to 0.5, then msw_flag = 5. If the blowing snow optical depth is less than 0.5, then msw_flag = 4. If

				no blowing snow is detected but there are cloud or aerosol layers detected, the msw_flag assumes values of 1 to 3 based on the height of the bottom of the lowest layer: < 1 km, msw_flag = 3; 1-3 km, msw_flag = 2; > 3km, msw_flag = 1. A value of -1 indicates that the signal to noise of the data was too low to reliably ascertain the presence of cloud or blowing snow. We expect values of -1 to occur only during daylight. (Source: Atmosphere ATBD); (Meanings: [-1 0 1 2 3 4 5]) (Values: ['cannot_determine' 'no_layers' 'layer_gt_3km' 'layer_between_1_and_3_km' 'layer_lt_1km' 'blow_snow_od_lt_0.5' 'blow_snow_od_gt_0.5'])
ocean_surf_reflec CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Ocean Surface Reflectance None	1	Ocean Surface Reflectance from Eqn 4.10 based on the Cox-Munk model. (Source: Atmosphere ATBD)
pce_mframe_cnt CHUNKED	UINT_4_LE(['Unlimited'])	PCE Major frame counter None	counts	Major Frame Counter - The major frame counter 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 (Source: ATL02)
prof_dist_x CHUNKED	DOUBLE(['Unlimited'])	Along Track Distance None	meters	Along-track distance from the equator crossing. (Source: ATL03g ATBD, Section 3.4)
prof_dist_y CHUNKED	FLOAT(['Unlimited'])	Across Track Distance from RGT None	meters	Across-Track distance from the reference ground track. (Source: ATL03g ATBD, Section 3.4)
range_to_top CHUNKED	FLOAT(['Unlimited'])	Range None	meters	Range from the spacecraft to the top of the atmosphere range window. (Source: Atmosphere ATBD)
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)
sig_count_hi CHUNKED	INTEGER(['Unlimited'])	Count of Signa Heightsl - High None	counts	Count of high-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_count_low CHUNKED	INTEGER(['Unlimited'])	Count of Signal Heights - Low None	counts	Count of low-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_count_med CHUNKED	INTEGER(['Unlimited'])	Count of Signal Heights - Medium None	counts	Count of medium-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_h_mean_hi CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Mean of SignalHeights - High None	meters	Mean height of high-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_h_mean_low	FLOAT(['Unlimited'])	Mean of Signal Heights - Low	meters	Mean height of low-confidence signal

CHUNKED	INVALID_R4B	None		photons (Source: ATL03 ATBD, Section 5)
sig_h_mean_med CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Mean of Signa Heightsl - Med None	meters	Mean height of medium-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_h_sdev_hi CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	SDev of Signal Heights -High None	meters	SDev of the heights of high-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_h_sdev_low CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	SDev of Signal Heights -Low None	meters	SDev of the heights of low-confidence signal photons (Source: ATL03 ATBD, Section 5)
sig_h_sdev_med CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	SDev of Signa Heights -Med None	meters	SDev of the heights of medium-confidence signal photons (Source: ATL03 ATBD, Section 5)
snow_ice CHUNKED	INTEGER(['Unlimited']) INVALID_I4B	Snow Ice Flag None	1	NOAA snow-ice flag. 0=ice free water; 1=snow free land; 2=snow; 3=ice (Source: Atmosphere ATBD); (Meanings: [0 1 2 3]) (Values: ['ice_free_water' 'snow_free_land' 'snow' 'ice'])
solar_azimuth CHUNKED	FLOAT(['Unlimited'])	solar azimuth None	degrees_east	The direction, eastwards from north, of the sun vector as seen by an observer at the laser ground spot. (Source: ATL03g ATBD)
solar_elevation CHUNKED	FLOAT(['Unlimited'])	solar elevation None	degrees	Solar Angle above or below the plane tangent to the ellipsoid surface at the laser spot. Positive values mean the sun is above the horizon, while negative values mean it is below the horizon. The effect of atmospheric refraction is not included. This is a low precision value, with approximately TBD degree accuracy. (Source: ATL03g ATBD)
surf_refl_true CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Estimated Surface Reflectance None	1	The value of the clear-sky surface reflectivity to use in the compuation of total column optical depth and cloud detection from the measures apparent surface reflectance (ASR). (Source: Atmosphere ATBD)
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'])
surf_type_igbp CHUNKED	INTEGER_1(['Unlimited'])	IGBP Surface Type None	1	IGBP Surface Type (Source: Atmosphere ATBD, IGBP Surface Type)
surface_bin CHUNKED	INTEGER(['Unlimited']) INVALID_I4B	Surface bin None	1	Vertially aligned, NRB bin number of the detected surface return. (Source: Atmosphere ATBD section 3.3.5)
surface_conf CHUNKED	FLOAT(['Unlimited'])	Surface signal confidence None	1	The level of confidence in the surface signal magnitude and location for each beam. (1.0 - lowest confidence; 100.0 - highest confidence).

				(Source: Atmosphere ATBD section 3.3.5)
surface_h_dens CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Surface h from density None	meters	Surface height from density (Source: Atmosphere ATBD)
surface_height CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Surface height None	meters	Height of the detected surface bin. (Source: Atmosphere ATBD section 3.3.5)
surface_sig CHUNKED	FLOAT(['Unlimited'])	Surface signal count None	counts	Number of photons in the detected surface bin. (Source: Atmosphere ATBD section 3.3.5)
surface_thresh CHUNKED	FLOAT(['Unlimited'])	Surface signal threshold None	photons	Surface signal threshold. (Source: Atmosphere ATBD section 3.3.5)
surface_width CHUNKED	INTEGER(['Unlimited'])	Surface signal width None	bins	The number of bins comprising the surface signal for each beam. (Source: Atmosphere ATBD section 3.3.5)
tx_pulse_energy CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Transmit Pulse Energy None	Joules	Transmit energy, from the laser internal energy monitor, split into per-beam measurements. (Source: ATL02 ATBD, Section 7.2)
Group: /profile_x/low_rate		Contains parameters related to atmosphere characteristic at 1 hz		
data_rate	(Attribute)	Data in this group is stored at a 1hz (1 per second) rate.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
bsnow_con CHUNKED	INTEGER_1(['Unlimited']) INVALID_I1B	Blowing snow confidence None	1	Blowing snow confidence. -3=surface not detected; -2=no surface wind;-1=no scattering layer found; 0=no top layer found; 1=none-little; 2=weak; 3=moderate; 4=moderate-high; 5=high; 6=very high (Source: Atmosphere ATBD); (Meanings: [-3 -2 -1 0 1 2 3 4 5 6]) (Values: ['surface_not_detected' 'no_surface_wind' 'no_scattering_layer_found' 'no_top_layer_found' 'none_little' 'weak' 'moderate' 'moderate_high' 'high' 'very_high'])
bsnow_h CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing Snow layer thickness None	meters	Blowing Snow layer thickness (height of top above surface) (Source: Atmosphere ATBD)
bsnow_intensity CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing Snow Intensity None	meters/second	Blowing snow intensity defined as the average scattering ratio within the blowing snow layer times the 10 m wind speed. (Source: Atmosphere ATBD)
bsnow_od CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing snow OD None	1	Blowing snow layer optical depth (Source: Atmosphere ATBD)
bsnow_prob CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Blowing Snow Probability None	1	The probability of blowing snow based on meteorological data. (Source: Atmosphere ATBD Section 4.5.1)
bsnow_psc CHUNKED	INTEGER_1(['Unlimited'])	Blowing snow PSC flag None	1	Blowing snow PSC flag. Indicates the potential for polar stratospheric clouds to affect the blowing snow retrieval, where 0=none and 3=maximum. This flag is a function of month and hemisphere and is only

				applied poleward of 60 north and south. (Source: Atmosphere ATBD Section 4.5); (Meanings: [0 1 2 3]) (Values: ['none' 'slight' 'moderate' 'maximum_bsnow_PSC_affected'])
cal_c CHUNKED	FLOAT(['Unlimited'])	Calibration Constant None	Photons*m^3 *sr / J	Calibration Constant (for each beam at 1 Hz) (Source: Atmosphere ATBD)
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: telemetry)
ds_va_bin_h COMPACT	FLOAT([700])	VA Bin Height Dimension Scale None	meters	Dimension scale containing the heights of the vertically-aligned bins. (Source: Atmosphere ATBD)
latitude CHUNKED	DOUBLE(['Unlimited'])	Latitude of the ATM histogram latitude	degrees_north	Latitude at the the top of the ATM histogram, WGS84, North=+, Derived from the geolocation of the ATM range window. (Source: ATL03g ATBD)
longitude CHUNKED	DOUBLE(['Unlimited'])	Longitude of the ATM histogram longitude	degrees_east	Longitude at the the top of the ATM histogram, WGS84, East=+, derived from the geolocation of the ATM range window. (Source: ATL03g ATBD)
met_cldprs CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	cloud_top_pressure pressure	Pa	Pressure of the highest cloud top at this location from GEOS5 data (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_ps CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Surface Pressure pressure	Pa	Surface Pressure (Pa) (Source: GEOS5 FPIT 3D DFPITI3NVASM)
met_qv10m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	specific_humidity_at_10m specific_humidity	kg kg-1	Specific humidity at 10 m above the displacement height (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_qv2m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	specific_humidity_at_2m specific_humidity	kg kg-1	Specific humidity at 2 m above the displacement height (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_slp CHUNKED	FLOAT(['Unlimited'])	sea_level_pressure sea_level_pressure	Pa	sea-level pressure (Pa) (Source: GEOS5 FPIT 3D DFPITI3NVASM)
met_t10m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	temperature_at_10m temperature	K	Temperature at 10m above the displacement height (K) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_t2m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	temperature_at_2m temperature	K	Temperature at 2m above the displacement height (K) (Source: GEOS5 FPIT 2D

				DFPITT1NXSLV)
met_tqi CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	cloud_ice None	kg m-2	Total column cloud ice (Kg/m2) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_tql CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	cloud_liquid_water None	kg m-2	Total column cloud liquid water (kg/m2) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_troppb CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	blended_tropopause_pressure pressure	Pa	Blended tropopause pressure (pa) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_tropt CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	blended_tropopause_temperature temperature	K	Tropopause temperature (k) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_ts CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	surface_temperature temperature	K	Surface skin temperature (K) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_u10m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Eastward_wind_at_10m eastward_wind	m s-1	Eastward wind at 10m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_u2m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Eastward_wind_at_2m eastward_wind	m s-1	Eastward wind at 2m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_u50m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Eastward_wind_at_50m eastward_wind	m s-1	Eastward wind at 50m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_v10m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Northward_wind_at_10m northward_wind	m s-1	Northward wind at 10m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_v2m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	Northward_wind_at_2m northward_wind	m s-1	Northward wind at 2m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
met_v50m CHUNKED	FLOAT(['Unlimited']) INVALID_R4B	northward_wind_at_50m northward_wind	m s-1	Northward wind at 50m above the displacement height (m/s-1) (Source: GEOS5 FPIT 2D DFPITT1NXSLV)
mol_backs_folded CHUNKED	FLOAT(['Unlimited', 700])	Folded molecular transmission profile None	m-1 sr-1	Folded molecular transmission profile, 30 m resolution, , m-1 sr-1; 20 km to -1 km (equation 3.17) (Source: Atmosphere ATBD)
mol_backscatter CHUNKED	FLOAT(['Unlimited', 700])	Molecular backscatter profile None	m-1 sr-1	Molecular backscatter profile, 30 m resolution, 20 km to -1 km (Source: Atmosphere ATBD)
molec_bkscat_p CHUNKED	FLOAT(['Unlimited', 700])	Pressure profile None	Pa	Pressure profiles from 20 km to -1 km (Source: Atmosphere ATBD)
molec_bkscat_rh CHUNKED	FLOAT(['Unlimited', 700])	Relative humidity profiles None	percentage	Relative humidity profiles from 20 km to -1 km (Source: Atmosphere ATBD)
molec_bkscat_t CHUNKED	FLOAT(['Unlimited', 700])	Temperature profile None	K	Temperature profiles from 20 km to -1 km (Source: Atmosphere ATBD)
molec_trans CHUNKED	FLOAT(['Unlimited', 700])	Molecular transmission profile None	1	Molecular transmission profile, 30 m resolution, 20 km to -1 km

				(Source: Atmosphere ATBD)
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)
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'])
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
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/profile_x		Contains per-profile quality assessment data.		
Label (Layout)	Datatype(Dims) Fillvalue	long_name standard_name	units	description
asr_avg CONTIGUOUS	FLOAT([1])	ASR Average None	1	Apparent surface reflectance average (Source: Atmosphere ATBD)
asr_max CONTIGUOUS	FLOAT([1])	ASR Maximum None	1	Apparent surface reflectance maximum (Source: Atmosphere ATBD)
asr_min CONTIGUOUS	FLOAT([1])	ASR Minimum None	1	Apparent surface reflectance minimum (Source: Atmosphere ATBD)
asr_std CONTIGUOUS	FLOAT([1])	ASR Standard Deviation None	1	Apparent surface reflectance stdev (Source: Atmosphere ATBD)
cab_mol_avg CONTIGUOUS	FLOAT([1])	CAB molec Avg None	1	CAB/molec average (Source: Atmosphere ATBD)
cld_asr_pct CONTIGUOUS	FLOAT([1])	Cloud ASR Percent None	percent	Percent time clouds from ASR were detected (Source: Atmosphere ATBD)
cld_avg CONTIGUOUS	FLOAT([1])	Cloud layer average None	1	Cloud layer average (Source: Atmosphere ATBD)
cld_max CONTIGUOUS	INTEGER([1])	Cloud layer max None	1	Cloud layer max (Source: ATL04)
cld_min	INTEGER([1])	Cloud layer min	1	Cloud layer min

CONTIGUOUS		None		(Source: ATL04)
cld_pct CONTIGUOUS	FLOAT([1])	Cloud Percent None	percent	Percent time clouds were detected (Source: Atmosphere ATBD)
cod_avg CONTIGUOUS	FLOAT([1])	COD Average None	1	Cloud Optical Depth average (Source: Atmosphere ATBD)
cod_max CONTIGUOUS	FLOAT([1])	COD Maximum None	1	Cloud Optical Depth maximum (Source: Atmosphere ATBD)
cod_min CONTIGUOUS	FLOAT([1])	COD Minimum None	1	Cloud Optical Depth minimum (Source: Atmosphere ATBD)
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: telemetry)
osr_avg CONTIGUOUS	FLOAT([1])	OSR Average None	1	Ocean surface reflectance average (Source: Atmosphere ATBD)
osr_max CONTIGUOUS	FLOAT([1])	OSR Maximum None	1	Ocean surface reflectance maximum (Source: Atmosphere ATBD)
osr_min CONTIGUOUS	FLOAT([1])	OSR Minimum None	1	Ocean surface reflectance minimum (Source: Atmosphere ATBD)
surf_pct CONTIGUOUS	FLOAT([1])	Percent Surface None	percent	Percent time surface height was detected (Source: ATL04)