1.0 DATA DICTIONARY

The following subsections list the data content of ATL04. Each subsection corresponds to a HDF5 group on the data product. The ATLAS Standard Data Products are designed to be self-documenting and contain additional descriptive information not presented here. The descriptive information within the data dictionary is limited to preserve readability.

1.1.1 Attributes

short_name	ATL04
title	SET_BY_META
level	L2
description	This data set (ATL04) contains normalized relative backscatter profiles, molecular backscatter profiles, and calibration constants computed from data acquired by the Advanced Topographic Laser Altimeter System (ATLAS) instrument on board the Ice, Cloud and land Elevation Satellite-2 (ICESat-2).
Conventions	CF-1.6
citation	SET_BY_META
contributor_name	Thomas A 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	Instrument Engineer, Investigator, Principle Investigator, Data Producer, Data Producer
creator_name	SET_BY_META
date_created	SET_BY_PGE
date_type	UTC
featureType	trajectory
geospatial_lat_max	0.0
geospatial_lat_min	0.0
geospatial_lat_units	degrees_north
geospatial_lon_max	0.0

geospatial_lon_min	0.0
geospatial_lon_units	degrees_east
granule_type	ATL04
hdfversion	SET_BY_PGE
history	SET_BY_PGE
identifier_file_uuid	SET_BY_PGE
identifier_product_doi	10.5067/ATLAS/ATL04.001
identifier_product_doi_authority	http://dx.doi.org
identifier_product_format_version	SET_BY_PGE
identifier_product_type	ATL04
institution	SET_BY_META
instrument	SET_BY_META
keywords	SET_BY_META
keywords_vocabulary	SET_BY_META
license	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	http://dx.doi.org
platform	SET_BY_META
processing_level	L2A
project	SET_BY_META
publisher_email	SET_BY_META
publisher_name	SET_BY_META
publisher_url	SET_BY_META
references	SET_BY_META
source	SET_BY_META
spatial_coverage_type	Horizontal

standard_name_vocabulary	CF-1.6
summary	SET_BY_META
time_coverage_duration	SET_BY_PGE
time_coverage_end	SET_BY_PGE
time_coverage_start	SET_BY_PGE
time_type	CCSDS UTC-A

1.1.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
ds_surf_type	INTEGER(5) -	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: Derived Flags: 1()=land, 2()=ocean, 3()=seaice, 4()=landice, 5()=inland_water

1.2 Group: /ancillary_data

Contains information ancillary to the data product. This may include product characteristics, instrument characteristics and/or processing constants.

1.2.1 Attributes

data_rate	Data within this group pertain to the granule in its entirety.

1.2.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
atlas_sdp_gps_epoch	DOUBLE(1) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
control	STRING(1) -	1	PGE-specific control file used to generate this granule. To re-use, replace breaks (BR) with linefeeds. Source: Operations
data_end_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the last data point within the granule. Source: Derived
data_start_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the first data point within the granule. Source: Derived
end_cycle	INTEGER(1) -	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 time	DOUBLE(1) -	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	INTEGER(1) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
end_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the last data point in the granule. Source: Derived
end_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the last data point in the granule. Source: Derived
end_orbit	INTEGER(1) -	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	INTEGER(1) -	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	INTEGER(1) -	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	STRING(1) -	1	Requested end time (in UTC CCSDS-A) of this granule. Source: Derived
granule_start_utc	STRING(1) -	1	Requested start time (in UTC CCSDS-A) of this granule. Source: Derived
qa_at_interval	DOUBLE(1) -	1	Statistics time interval for along-track QA data. Source: control
release	STRING(1) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
start_cycle	INTEGER(1) -	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 time	DOUBLE(1) -	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	INTEGER(1) -	1	The starting geolocation segment number associated with the data contained within this granule. ICESat granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created approximately every 20m from the start of the orbit to the end. The geolocation segments help align the ATLAS strong a weak beams and provide a common segment length for the L2 and higher products. The geolocation segment indices differ slightly from orbit-to-orbit because of the irregular shape of the Earth. The geolocation segment indices on ATL01 and ATL02 are only approximate because beams have not been aligned at the time of their creation. Source: Derived
start_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the first data point in the granule. Source: Derived
start_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the first data point in the granule. Source: Derived
start_orbit	INTEGER(1) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
start_region	INTEGER(1) -	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	INTEGER(1) -	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	STRING(1) -	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

1.3 Group: /ancillary_data/atmosphere

Contains general ancillary parameters.

1.3.1 Attributes

data_rate	Data within this group pertain to the granule in its entirety.

1.3.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
aer_scat_rat	FLOAT(1) -	1	Aerosol Scattering Ratio in the calibration zone. Source: Atmosphere ATBD Part 1, section "Molecular Scattering Folding Correction"
alpha_day_pce1	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE1/day)

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_day_pce2	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE2/day) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_day_pce3	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE3/day) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_night_pce1	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE1/night) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_night_pce2	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE2/night) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_night_pce3	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE3/night) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_twilight_pce1	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE1/twilight) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_twilight_pce2	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE2/twilight) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
alpha_twilight_pce3	FLOAT(1) -	1	Molecular Folding Scaling Factor. (PCE3/twilight) Source: Atmosphere ATBD, part 1, section "Molecular Scattering Folding Correction"
atlas_atm_hist_binsize	FLOAT(1) -	meters	Nominal size of each ATM histogram bin, in meters. Source: Atmosphere ATBD Part 1
atlas_atm_hist_binsize_s	DOUBLE(1) -	seconds	Nominal size of each ATM histogram bin, in seconds. Source: Atmosphere ATBD Part 1
atlas_atm_shot_sum_25hz	INTEGER(1) -	counts	Number of shots summed to compute an ATM histogram at 25 hz (nominal). Source: Atmosphere ATBD Part 1

Name Standard Name	Type(Dims) FillValue	Units	Description
atlas_atm_shot_sum_50hz	INTEGER(1) -	counts	Number of shots summed to compute an ATM histogram at 50 hz (diagnostic). Source: Atmosphere ATBD Part 1
atlas_laser_wavelength_m	DOUBLE(1) -	meters	ATLAS Laser wavelength, in meters. Source: Atmosphere ATBD Part 1
atlas_laser_wavelength_nm	FLOAT(1) -	nm	ATLAS Laser wavelength, in nanometers. Source: Atmosphere ATBD Part 1
atlas_n_atm_hist_bins	INTEGER(1) -	counts	Number of ATM histogram bins. Source: Atmosphere ATBD Part 1
atlas_n_pce	INTEGER(1) -	1	Number of ATLAS PCE boards. Source: Atmosphere ATBD Part 1
back_f2	FLOAT(1) -	1	Scaling factor in Method 2 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 2"
backg_day_exp_factor	FLOAT(1) -	1	Background daytime exponent factor in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_day_scale_factor1	FLOAT(1) -	1	Background daytime scaling factor 1 in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_day_scale_factor2	FLOAT(1) -	1	Background daytime scaling factor 2 in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_max_solar_elev	FLOAT(1) -	degrees	Background maximum solar elevation angle in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_min_solar_elev	FLOAT(1) -	degrees	Background minimum solar elevation angle in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_night_bkgd	FLOAT(1) -	1	Background nighttime background in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_night_scale_factor	FLOAT(1) -	1	Background nighttime scaling factor in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"

Name Standard Name	Type(Dims) FillValue	Units	Description
backg_nseg	INTEGER(1) -	counts	Number of background segments in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_response_time	FLOAT(1) -	1	Background response time in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
backg_select	INTEGER(1) -	1	The background method used in calculation of NRB. Source: Atmosphere ATBD Part 1, section "Background Computation" Flags: 1()=method1, 2()=method2, 3()=method3
backg_twilight_scale_factor	FLOAT(1) -	1	Background twilight scaling factor in Method 1 background computation. Source: Atmosphere ATBD Part 1, section "Background Method 1"
boltzmann_const	FLOAT(1) -	erg/K	Boltzmann constant. Source: Atmosphere ATBD Part 1, section "Molecular Backscatter Computation"
cal_atm_trans	FLOAT(1) -	1	Particulate transmission from top of atmosphere to the calibration height. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_bot_ht	FLOAT(1) -	meters	Bottom height of the calibration zone. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_cloud_thres	FLOAT(1) -	counts	Threshold for excluding NRB data in calibration zone. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_day_pce1	FLOAT(1) -	1	Daytime calibration constant for pce1 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_day_pce2	FLOAT(1) -	1	Daytime calibration constant for pce2 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"

Name Standard Name	Type(Dims) FillValue	Units	Description
cal_day_pce3	FLOAT(1) -	1	Daytime calibration constant for pce3 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_default	FLOAT(1) -	photons*m^3 *sr / J	Default atmosphere calibration constant. Used by default when no calibration data have been computed for an ATL04 granule. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_integ_time	FLOAT(1) -	seconds	Calibration integration time. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_lat_bound	DOUBLE(1) -	degrees	The latitude boundary for calibration calculation. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_night_pce1	FLOAT(1) -	1	Nighttime calibration constant for pce1 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_night_pce2	FLOAT(1) -	1	Nighttime calibration constant for pce2 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_night_pce3	FLOAT(1) -	1	Nighttime calibration constant for pce3 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_scat_ratio	FLOAT(1) -	1	Calibration Zone aerosol scattering ratio. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_select	INTEGER(1) -	1	Calibration algorithm used. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere" Flags: 1()=method1, 2()=method2, 3()=method3
cal_solar_angle_limit	FLOAT(1) -	degrees	Minimum solar zenith angle for calibration calculation.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_solar_elev_max	FLOAT(1) -	degrees	Maximum solar elevation angle in calibration Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_solar_elev_min	FLOAT(1) -	degrees	Minimum solar elevation angle in calibration Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_top_ht	FLOAT(1) -	meters	Top height of the calibration zone. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_twilight_pce1	FLOAT(1) -	1	Twilight calibration constant for pce1 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_twilight_pce2	FLOAT(1) -	1	Twilight calibration constant for pce2 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_twilight_pce3	FLOAT(1) -	1	Twilight calibration constant for pce3 in Method 2. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
chappius_coef	FLOAT(1) -	1	Chappius ozone absorption coefficient. Source: Atmosphere ATBD Part 1, section "Ozone Transmission Computation"
dead_time_sfac	FLOAT(1) -	1	Dead time signal factor. Source: Atmosphere ATBD Part 1, section "Dead Time Correction"
default_nrb_day	FLOAT(3) -	photons m2/Joule	Default value for daytime NRB used to replace NRB values that are out of range for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
default_nrb_night	FLOAT(3) -	photons m2/Joule	Default value for nighttime NRB - used to replace NRB values that are out of range for each pce for calibration method 3.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
default_nrb_saa	FLOAT(3) -	photons m2/Joule	Default value for NRB used to replace NRB values that are out of range when in the South Atlantic Anomaly during nighttime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
default_nrb_twilight	FLOAT(3) -	photons m2/Joule	Default value for twilight NRB - used to replace NRB values that are out of range for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
deg2rad	DOUBLE(1) -	1	Degrees to radians conversion factor. Source: Globals
dtime_max	FLOAT(1) -	1	Maximum dead time correction value applied to the surface signal. Source: Atmosphere ATBD Part 1, section "Surface Signal"
dtime_select	INTEGER(1) -	1	Deadtime factor used. Source: Atmosphere ATBD Part 1, section "Surface Signal" Flags: 1()=dtime_fact1, 2()=dtime_fact2
gas_const_r	DOUBLE(1) -	1	Ideal gas constant (R). Source: Atmosphere ATBD Part 1
grd_search_width	INTEGER(1) -	bins	Ground detection search width. Source: Atmosphere ATBD Part 1, section "Surface Signal"
grd_thres_atl03	FLOAT(1) -	photons/bin	Threshold for Ground detection when using ATL03-classified signal. Source: Atmosphere ATBD Part 1, section "Dead Time Correction"
grd_thres_sfac1	FLOAT(1) -	1	Ground detection signal factor 1. Source: Atmosphere ATBD Part 1, Section "Surface Signal"
grd_thres_sfac2	FLOAT(1) -	1	Ground detection signal factor 2. Source: Atmosphere ATBD Part 1, Section "Surface Signal"
ht_min	FLOAT(1) -	meters	Minimum height to use in ATM profile. Source: Atmosphere ATBD Part 1, section "Background Method 2"

Name Standard Name	Type(Dims) FillValue	Units	Description
king_fact	FLOAT(1) -	1	King factor for molecular transmission. Source: Atmosphere ATBD Part 1, section "Molecular Transmission"
max_calib_day	FLOAT(3) -	photons*m3sr/J	Maximum calculated calibration value allowed for daytime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_calib_night	FLOAT(3) -	photons*m3sr/J	Maximum calculated calibration value allowed for nighttime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_calib_twilight	FLOAT(3) -	photons*m3sr/J	Maximum calculated calibration value allowed for twilight for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_nrb_day	FLOAT(3) -	photons m2/Joule	Maximum daytime NRB accepted for filtered NRB data for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_nrb_night	FLOAT(3) -	photons m2/Joule	Maximum nighttime NRB accepted for filtered NRB array for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_nrb_saa	FLOAT(3) -	photons m2/Joule	Maximum NRB accepted for filtered NRB data when in the South Atlantic Anomaly during nighttime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_nrb_twilight	FLOAT(3) -	photons m2/Joule	Maximum twilight NRB accepted for filtered NRB array for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
max_photon	INTEGER(1) -	photons/bin	The photon level that the average of bin 50 to 200 of the raw profiles must exceed to be

Name Standard Name	Type(Dims) FillValue	Units	Description
			categorized as bad data. Source: Atmosphere ATBD Part 1, section "Vertical Height Adjustment"
min_calib_day	FLOAT(3) -	photons*m3sr/J	Minimum calculated calibration allowed for daytime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
min_calib_night	FLOAT(3) -	photons*m3sr/J	Minimum calculated calibration value allowed for nighttime for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
min_calib_twilight	FLOAT(3) -	photons*m3sr/J	Minimum calculated calibration value allowed for twilight for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
min_nrb_day	FLOAT(3) -	photons m2/Joule	Minimum daytime NRB accepted for filtered NRB data for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
min_nrb_night	FLOAT(3) -	photons m2/Joule	Minimum nighttime NRB accepted for filtered NRB data for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
min_nrb_twilight	FLOAT(3) -	photons m2/Joule	Minimum twilight NRB accepted for filtered NRB data for each pce for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
molec_top_ht	FLOAT(1) -	meters	Top height of molecular profile. Source: Atmosphere ATBD Part 1
night_thresh_min	FLOAT(1) -	1	The minimum number of photons within a 400 shot sum that must be present in order for the surface signal to be detected. Source: Atmosphere ATBD Part 1, section "Surface Signal"

Name Standard Name	Type(Dims) FillValue	Units	Description
nrb_average_period	INTEGER(1) -	seconds	Number of seconds to average the smoothed and filtered NRB array before computing the calibration constant for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
nrb_smooth	INTEGER(1) -	1	Number of points to average the NRB data for calibration method 3. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
num_molec_bins	INTEGER(1) -	counts	Number of bins in molecular profile. Source: Atmosphere ATBD Part 1
num_va_bins	INTEGER(1) -	counts	Number of vertically aligned bins. Source: Atmosphere ATBD Part 1
ozone_const	FLOAT(1) -	1	Ozone column density constant. Source: Atmosphere ATBD Part 1, section "Ozone Transmission Computation"
pi	DOUBLE(1) -	counts	PI. Source: Atmosphere ATBD Part 1
planck_const	DOUBLE(1) -	Js	Planck constant (h). Source: Atmosphere ATBD Part 1, section "Calculation of the Calibration Coefficient"
proc_interval	DOUBLE(1) -	seconds	The number of seconds of atmosphere data processed in one chunk. Source: Control
pulse_ns	DOUBLE(1) -	sq meters	The time between ATLAS pulses. Source: Atmosphere ATBD Part 1, section "Transmit Echo Pulse"
quant_det_eff	FLOAT(1) -	1	Detector quantum efficiency (Qe). Source: Atmosphere ATBD Part 1
receiver_trans	FLOAT(1) -	1	Nominal Receiver Optics Throughput. Source: Atmosphere ATBD Part 1
saa_alpha_fac	FLOAT(3) -	1	Molecular folding scaling factor when in the South Atlantic Anomaly during nighttime for each pce. Source: Atmosphere ATBD Part 1, section "Molecular Scattering Folding Correction"
saa_cal_fac	FLOAT(1) -	1	Factor to multiply the calibration constants by when within the SAA and the solar elevation angle is < calib_solar_elev_max in calibration method 3. Source: Atmosphere ATBD Part 1, section

Name Standard Name	Type(Dims) FillValue	Units	Description
			"Calibration Algorithm using the Atmosphere"
saa_latmax	FLOAT(1) -	degrees_north	Latitude maximum of box that encompasses the area affected by the South Atlantic Anomaly (SAA). Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
saa_latmin	FLOAT(1) -	degrees_north	Latitude minimum of box that encompasses the area affected by the South Atlantic Anomaly (SAA). Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
saa_lonmax	FLOAT(1) -	degrees_east	Longitude maximum of box that encompasses the area affected by the South Atlantic Anomaly (SAA). Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
saa_lonmin	FLOAT(1) -	degrees_east	Longitude minimum of box that encompasses the area affected by the South Atlantic Anomaly (SAA). Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
saa_scale_fac	FLOAT(1) -	1	Scale factor for computing the background in method 1 within the south Atlantic anomaly box. Source: Atmosphere ATBD Part 1, section "Background Method 1"
speed_of_light	DOUBLE(1) -	meters/second	Speed of light (c). Source: Atmosphere ATBD Part 1
telescope_area	DOUBLE(1) -	sq meters	Effective collection area of telescope (At). Source: Atmosphere ATBD Part 1, section "Molecular Scattering Folding Correction"
tep_start	DOUBLE(1) -	ns	The start time of the TEP removal window. Source: Atmosphere ATBD Part 1, section "Transmit Echo Pulse"
tep_width	DOUBLE(1) -	sq meters	The width of the TEP removal window. Source: Atmosphere ATBD Part 1, section "Transmit Echo Pulse"
va_top_ht	FLOAT(1) -	meters	Top height of vertically aligned profile. Source: Atmosphere ATBD Part 1

1.4 Group: /meteorology_molec_bkscat

Contains sampled GEOS5_FPIT meteorological model data and molecular backscatter. This data is created from the time/locations of the center profile.

1.4.1 Attributes

data_rate	Data in this group is stored at a 1hz (1 per second) rate.

1.4.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
delta_time time	DOUBLE(:) -	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
ds_va_bin_h	FLOAT(700) -	meters	Dimension scale containing the heights of the vertically-aligned bins. Source: Derived
latitude latitude	DOUBLE(:) -	degrees_north	Latitude at the the top of the Atmosphere histogram, WGS84, North=+, Derived from the geolocation of the Atmosphere range window. Source: ATL03g ATBD
longitude longitude	DOUBLE(:) -	degrees_east	Longitude at the the top of the Atmosphere histogram, WGS84, East=+, derived from the geolocation of the Atmosphere range window. Source: ATL03g ATBD
met_cldprs pressure	FLOAT(:) INVALID_R4B	Pa	Pressure of the highest cloud top at this location. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_ps pressure	FLOAT(:) INVALID_R4B	Pa	Surface Pressure (Pa). Source: GEOS5 FPIT 3D DFPITI3NVASM
met_qv10m specific_humidity	FLOAT(:) INVALID_R4B	kg kg-1	Specific humidity at 10 m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_qv2m specific_humidity	FLOAT(:) INVALID_R4B	kg kg-1	Specific humidity at 2 m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV

Name Standard Name	Type(Dims) FillValue	Units	Description
met_slp sea_level_pressure	FLOAT(:) -	Pa	Sea-level pressure. Source: GEOS5 FPIT 3D DFPITI3NVASM
met_t10m temperature	FLOAT(:) INVALID_R4B	K	Temperature at 10m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_t2m temperature	FLOAT(:) INVALID_R4B	K	Temperature at 2m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_tqi	FLOAT(:) INVALID_R4B	kg m-2	Total column cloud ice. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_tql	FLOAT(:) INVALID_R4B	kg m-2	Total column cloud liquid water. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_troppb pressure	FLOAT(:) INVALID_R4B	Pa	Blended tropopause pressure. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_tropt temperature	FLOAT(:) INVALID_R4B	K	Tropopause temperature. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_ts temperature	FLOAT(:) INVALID_R4B	K	Surface skin temperature. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_u10m eastward_wind	FLOAT(:) INVALID_R4B	m s-1	Eastward wind at 10m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_u2m eastward_wind	FLOAT(:) INVALID_R4B	m s-1	Eastward wind at 2m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_u50m eastward_wind	FLOAT(:) INVALID_R4B	m s-1	Eastward wind at 50m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_v10m northward_wind	FLOAT(:) INVALID_R4B	m s-1	Northward wind at 10m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_v2m northward_wind	FLOAT(:) INVALID_R4B	m s-1	Northward wind at 2m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
met_v50m northward_wind	FLOAT(:) INVALID_R4B	m s-1	Northward wind at 50m above the displacement height. Source: GEOS5 FPIT 2D DFPITT1NXSLV
mol_backs_folded	FLOAT(700, :) -	m-1 sr-1	Folded molecular transmission profile, 30 m resolution, 20 km to -1 km. Source: Atmosphere ATBD Part 1, section "Molecular Scattering Folding Correction"

Name Standard Name	Type(Dims) FillValue	Units	Description
mol_backscatter	FLOAT(700, :) -	m-1 sr-1	Molecular backscatter profile, 30 m resolution, 20 km to -1 km. Source: Atmosphere ATBD Part 1, section "Molecular Backscatter Computation"
molec_bkscat_p	FLOAT(700, :) -	Pa	Pressure profile from 20 km to -1 km. Source: Atmosphere ATBD Part 1
molec_bkscat_rh	FLOAT(700, :) -	percentage	Relative humidity profile from 20 km to -1 km. Source: Atmosphere ATBD Part 1
molec_bkscat_t	FLOAT(700, :) -	K	Temperature profile from 20 km to -1 km. Source: Atmosphere ATBD Part 1
molec_trans	FLOAT(700, :) -	1	Molecular transmission profile, 30 m resolution, 20 km to -1 km. Source: Atmosphere ATBD Part 1, section "Molecular Transmission"
ozone_trans	FLOAT(700, :) -	1	Ozone transmission profile, 30 m resolution, 20 km to -1 km. Source: Atmosphere ATBD Part 1, section "Ozone Transmission Computation"
segment_id	INTEGER(:) -	1	A 7 digit number identifying 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
surf_type	INTEGER_1(5, :) -	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 Flags: 0()=not_type, 1()=is_type

1.5 Group: /orbit_info

Contains orbit information.

1.5.1 Attributes

data_rate	Varies. Data are only provided when one of the stored values (besides time) changes.

1.5.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
crossing_time time	DOUBLE(:) -	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	INTEGER_1(:) -	1	A count of the number of exact repeats of this reference orbit. Source: Operations
lan	DOUBLE(:) -	degrees_east	Longitude at the ascending node crossing. Source: POD/PPD
orbit_number	UINT_2_LE(:) -	1	Unique identifying number for each planned ICESat-2 orbit. Source: Operations
rgt	INTEGER_2(:) -	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	INTEGER_1(:) -	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 Flags: 0()=backward, 1()=forward, 2()=transition
sc_orient_time time	DOUBLE(:) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
			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

1.6 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.

1.6.1 Attributes

data_rate	Data in this group is stored at a 25hz (25 per second) rate.

1.6.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
atm_rw_width_m	FLOAT(:) -	meters	The range, in meters, from the Atmospheric range window start to the range window stop. Source: ATL02
atm_tw_top	FLOAT(:) -	meters	The geolocated ellipsoidal height at the top of the Atmospheric range window. Source: ATL03g ATBD
backg_mean2	FLOAT(:) -	photons/bin	Signal mean from Method 2. Source: Atmosphere ATBD Part 1, section "Background Method 2"
backg_method1	FLOAT(:) -	photons/bin	Background from Method 1. Source: Atmosphere ATBD Part 1, section "Background Method 1"

Name Standard Name	Type(Dims) FillValue	Units	Description
backg_method2	FLOAT(:) -	photons/bin	Background from Method 2. Source: Atmosphere ATBD Part 1, section "Background Method 2"
backg_method3	FLOAT(:) INVALID_R4B	photons/bin	Background from Method 3. Source: Atmosphere ATBD Part 1, section "Background Method 3"
backg_std_dev2	FLOAT(:) -	photons/bin	Background standard deviation from Method 2. Source: Atmosphere ATBD Part 1, section "Background Method 2"
beam_azimuth	FLOAT(:) INVALID_R4B	degrees_east	Beam azimuth. Source: ATL03 ATBD
beam_elevation	FLOAT(:) INVALID_R4B	degrees	Beam elevation. Source: ATL03 ATBD
bg_sensitivity	FLOAT(:) INVALID_R4B	events/sec	Receiver response per watt of continuous illumination in the passband from a diffuse source larger than the field of view, in the absence of any dead time effects. Source: ATL02 ATBD
cloud_fold_flag	INTEGER_1(:) INVALID_I1B	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. Source: Atmosphere ATBD Part 1, section "Cloud Folding Flag" Flags: 0()=no_folding, 1()=goes5_indicates, 2()=profile_indicates, 3()=both_indicate
delta_time time	DOUBLE(:) -	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
dem_flag	INTEGER_1(:) INVALID_I1B	1	Indicates source of the DEM height. Values: 0=None, 1=Arctic, 2=Global, 3=MSS, 4=Antarctic. Source: Atmosphere ATBD Part 1 Flags: 0()=none, 1()=arctic, 2()=global, 3()=mss, 4()=antarctic
dem_h	FLOAT(:) INVALID_R4B	meters	Best available DEM (in priority of Arctic/Antarctic/Global/MSS) value at the geolocation point. Source: Atmosphere ATBD Part 1

Name Standard Name	Type(Dims) FillValue	Units	Description
ds_va_bin_h	FLOAT(700) -	meters	Dimension scale containing the heights of the vertically-aligned bins. Source: Derived
dtime_fac1	FLOAT(:) INVALID_R4B	1	Dead time correction factor for surface signal computed from radiometric lookup table. Source: Atmosphere ATBD Part 1, section "Dead Time Correction"
dtime_fac2	FLOAT(:) INVALID_R4B	1	Dead time correction factor for surface signal computed from equation. Source: Atmosphere ATBD Part 1, section "Dead Time Correction"
latitude latitude	DOUBLE(:) -	degrees_north	Latitude at the the top of the Atmosphere histogram, WGS84, North=+, Derived from the geolocation of the Atmosphere range window. Source: ATL03g ATBD
longitude longitude	DOUBLE(:) -	degrees_east	Longitude at the the top of the Atmosphere histogram, WGS84, East=+, derived from the geolocation of the Atmosphere range window. Source: ATL03g ATBD
nrb_bot_bin	INTEGER(:) INVALID_I4B	bin number	The ending (bottom) bin number within the 20 to -1 km vertically aligned profile where data are valid. Bin number starts at 1. Source: Atmosphere ATBD Part 1, section "Vertical Height Adjustment"
nrb_profile	FLOAT(700, :) INVALID_R4B	photons km2/Joule	Normalized relative backscatter (NRB) profile vertically aligned to 20 to -1 km with vertical resolution of 30 m. Source: Atmosphere ATBD Part 1, section "Vertical Height Adjustment"
nrb_top_bin	INTEGER(:) INVALID_I4B	bin number	The starting (top) bin number within the 20 to -1 km vertically aligned profile where data are valid. Bin number starts at 1. Source: Atmosphere ATBD Part 1, section "Vertical Height Adjustment"
pce_mframe_cnt	UINT_4_LE(:) -	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 diagnostic 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
podppd_flag	INTEGER_1(:) 0	1	Composite POD/PPD flag that indicates the quality of input geolocation products for the specific ATL04 segment. A non-zero value may indicate that geolocation solutions are

Name Standard Name	Type(Dims) FillValue	Units	Description
			degraded or that ATLAS is within a calibration scan period (CAL). The ATL03 sigma values should indicate the degree of uncertainty associated with the degradation. Possible non-CAL values are: 0=NOMINAL; 1=POD_DEGRADE; 2=PPD_DEGRADE; 3=PODPPD_DEGRADE; possible CAL values are: 4=CAL_NOMINAL; 5=CAL_POD_DEGRADE; 6=CAL_PPD_DEGRADE; 7=CAL_PODPPD_DEGRADE; Source: ANC04, ANC05 Flags: 0()=nominal, 1()=pod_degrade, 2()=ppd_degrade, 3()=podppd_degrade, 4()=cal_nominal, 5()=cal_pod_degrade, 6()=cal_ppd_degrade, 7()=cal_podppd_degrade
prof_dist_x	DOUBLE(:) -	meters	Along-Track distance from the equator crossing. Source: ATL03g ATBD
prof_dist_y	FLOAT(:) -	meters	Across-Track distance from the reference ground track. Source: ATL03g ATBD
range_to_top	FLOAT(:) -	meters	Range from the spacecraft to the top of the atmosphere range window. Source: Atmosphere ATBD Part 1
ret_sensitivity	FLOAT(:) INVALID_R4B	events/pulse	Receiver response per joule/return pulse in the field of view, in the absence of any deadtime effects. Source: ATL02 ATBD
sc_alt	DOUBLE(:) -	meters	Height of the spacecraft above the WGS84 ellipsoid. Source: ATL03g ATBD
segment_id	INTEGER(:) -	1	A 7 digit number identifying 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
sig_count_hi	INTEGER(:) -	counts	Count of high-confidence signal photons. Source: ATL03 ATBD
sig_count_low	INTEGER(:) -	counts	Count of low-confidence signal photons. Source: ATL03 ATBD
sig_count_med	INTEGER(:) -	counts	Count of medium-confidence signal photons. Source: ATL03 ATBD
sig_h_mean_hi	FLOAT(:) INVALID_R4B	meters	Mean height of high-confidence signal photons. Source: ATL03 ATBD

Name Standard Name	Type(Dims) FillValue	Units	Description
sig_h_mean_low	FLOAT(:) INVALID_R4B	meters	Mean height of low-confidence signal photons. Source: ATL03 ATBD
sig_h_mean_med	FLOAT(:) INVALID_R4B	meters	Mean height of medium-confidence signal photons. Source: ATL03 ATBD
sig_h_sdev_hi	FLOAT(:) INVALID_R4B	meters	Standard Deviation of the heights of high-confidence signal photons. Source: ATL03 ATBD
sig_h_sdev_low	FLOAT(:) INVALID_R4B	meters	Standard Deviation of the heights of low-confidence signal photons. Source: ATL03 ATBD
sig_h_sdev_med	FLOAT(:) INVALID_R4B	meters	Standard Deviation of the heights of medium-confidence signal photons. Source: ATL03 ATBD
solar_azimuth	FLOAT(:) -	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	FLOAT(:) -	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_type	INTEGER_1(5, :) -	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 Flags: 0()=not_type, 1()=is_type
surf_type_igbp	INTEGER_1(:) -	1	IGBP Surface Type. Source: Atmosphere ATBD Part 1
surface_bin	INTEGER(:) INVALID_I4B	bin number	Vertically aligned, NRB bin number of the detected surface return. Source: Atmosphere ATBD Part 1, section "Surface Signal"
surface_conf	FLOAT(:) -	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 Part 1, section "Surface Signal"

Name Standard Name	Type(Dims) FillValue	Units	Description
surface_height	FLOAT(:) INVALID_R4B	meters	Height of the detected surface bin. Source: Atmosphere ATBD Part 1, section "Surface Signal"
surface_sig	FLOAT(:) -	counts	Number of photons in the detected surface bin. Source: Atmosphere ATBD Part 1, section "Surface Signal"
surface_thresh	FLOAT(:) -	counts	Surface signal threshold. Source: Atmosphere ATBD Part 1, section "Surface Signal"
surface_width	INTEGER(:) -	bins	The number of bins comprising the surface signal for each beam. Source: Atmosphere ATBD Part 1, section "Surface Signal"
tx_pulse_energy	FLOAT(:) INVALID_R4B	Joules	Transmit energy, from the laser internal energy monitor, split into per-beam measurements. Source: ATL02 ATBD

1.7 Group: /profile_x/bckgrd_atlas

Contains the ATLAS 50-shot background data and derivations.

1.7.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
bckgrd_counts	INTEGER(:) -	counts	Onboard 50 shot background (200 Hz) sum of photon events within the altimetric range window. Source: ATL03 ATBD
bckgrd_counts_reduced	INTEGER(:) -	counts	Number of photon counts in the 50-shot sum after subtracting the number of signal photon events in that span. Source: ATL03 ATBD
bckgrd_hist_top	FLOAT(:) -	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
bckgrd_int_height	FLOAT(:) -	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

Name Standard Name	Type(Dims) FillValue	Units	Description
bckgrd_int_height_reduced	FLOAT(:) -	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
bckgrd_rate	FLOAT(:) -	counts / second	The background count rate from the 50-shot altimetric histogram after removing the number of likely signal photons. Source: ATL03 ATBD
delta_time time	DOUBLE(:) -	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	UINT_4_LE(:) -	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 diagnostic 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

1.8 Group: /profile_x/calibration

Contains calibration data associated with a PCE strong beam.

1.8.1 Attributes

data_rate	Data within this group stored at a low rate corresponding to the number of times ATLAS passes with the calibration boundary conditions (lat > 60 and solar_angle > 90)/

1.8.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
cal_c	FLOAT(:) INVALID_R4B	photons*m^3 *sr / J	Calibration constant. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"

Name Standard Name	Type(Dims) FillValue	Units	Description
cal_c_trans	FLOAT(:) INVALID_R4B	1	The total transmission used to compute calibration constant. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_con	INTEGER(:) INVALID_I4B	1	Calibration Confidence Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_molec	FLOAT(:) INVALID_R4B	m-1 sr-1	Molecular Backscatter value used to compute calibration constant. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_nrb	FLOAT(:) INVALID_R4B	1	NRB value used to compute calibration constant. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
cal_ozone_trans	FLOAT(:) INVALID_R4B	1	Ozone transmission term used to compute calibration constant. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
delta_time time	DOUBLE(:) -	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
delta_time_end time	DOUBLE(:) -	seconds since 2018-01-01	Number of GPS seconds since the ATLAS SDP epoch where the cal interval ended. The corresponding start time of the interval is delta_time. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: Derived via Time Tagging
latitude latitude	DOUBLE(:) -	degrees_north	Start Latitude of calibration interval. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"

Name Standard Name	Type(Dims) FillValue	Units	Description
latitude_end	DOUBLE(:) -	degrees_north	Stop Latitude of calibration interval. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
longitude longitude	DOUBLE(:) -	degrees_east	Start Longitude of calibration interval. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"
longitude_end	DOUBLE(:) -	degrees_east	Stop Longitude of calibration interval. Source: Atmosphere ATBD Part 1, section "Calibration Algorithm using the Atmosphere"

1.9 Group: /quality_assessment

Contains quality assessment data. This may include QA counters, QA along-track data and/or QA summary data.

1.9.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
qa_granule_fail_reason	INTEGER(1) -	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 Flags: 0()=no_failure, 1()=PROCESS_ERROR, 2()=INSUFFICIENT_OUTPUT, 3()=failure_3, 4()=failure_4, 5()=OTHER_FAILURE
qa_granule_pass_fail	INTEGER(1) -	1	Flag indicating granule quality. 0=granule passes automatic QA. 1=granule fails automatic QA. Source: Operations Flags: 0()=PASS, 1()=FAIL

1.10 Group: /quality_assessment/profile_x

Contains quality assessment data for each profile

1.10.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
back1_avg	FLOAT(1) INVALID_R4B	counts	Background method 1 average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"

Name Standard Name	Type(Dims) FillValue	Units	Description
back1_max	FLOAT(1) INVALID_R4B	counts	Background method 1 maximum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back1_min	FLOAT(1) INVALID_R4B	counts	Background method 1 minimum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back2_avg	FLOAT(1) INVALID_R4B	counts	Background method 2 average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back2_max	FLOAT(1) INVALID_R4B	counts	Background method 2 maximum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back2_min	FLOAT(1) INVALID_R4B	counts	Background method 2 minimum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back3_avg	FLOAT(1) INVALID_R4B	counts	Background method 3 average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back3_max	FLOAT(1) INVALID_R4B	counts	Background method 3 maximum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
back3_min	FLOAT(1) INVALID_R4B	counts	Background method 3 minimum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
cal_c_avg	FLOAT(1) INVALID_R4B	photons*m^3 *sr / J	Calibration Constant average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
cal_c_std	FLOAT(1) INVALID_R4B	photons*m^3 *sr / J	Calibration Constant standard deviation. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
delta_time time	DOUBLE(1) -	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
ht_diff_avg	FLOAT(1) INVALID_R4B	meters	Average of the surface height minus the DEM height.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: Atmosphere ATBD Part 1, section "Quality Assessment"
n_val_cal	INTEGER(1) -	1	Number valid calibration constants. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
surf_pct	FLOAT(1) INVALID_R4B	percent	Percent time surface height was detected. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
surf_sig_avg	FLOAT(1) INVALID_R4B	counts	Surface signal average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
surf_sig_max	FLOAT(1) INVALID_R4B	counts	Surface signal maximum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
surf_sig_min	FLOAT(1) INVALID_R4B	counts	Surface signal minimum. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
tx_nrg_avg	FLOAT(1) INVALID_R4B	joules	Laser energy average. Source: Atmosphere ATBD Part 1, section "Quality Assessment"
tx_nrg_std	FLOAT(1) INVALID_R4B	joules	Laser energy standard deviation. Source: Atmosphere ATBD Part 1, section "Quality Assessment"