1.0 DATA DICTIONARY

The following subsections list the data content of ATL11. 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	ATL11
title	ATLAS/ICESat-2 L3B Slope-Corrected Land Ice Height Time Series
level	L3B
description	This data set provides time series of land-ice surface heights derived from the ICESat-2 ATL06 Land Ice Height product. It is a spatially organized product that allows easy access to height-change information derived from ICESat-2 observations.
Conventions	CF-1.6
citation	Cite these data in publications as follows: The data used in this study were produced by the ICESat-2 Science Project Office at NASA/GSFC. The data archive site is the NASA National Snow and Ice Data Center Distributed Active Archive Center.
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	GSFC I-SIPS > ICESat-2 Science Investigator-led Processing System
date_created	2025-09-07T07:54:54.016394Z
date_type	UTC
featureType	trajectory
geospatial_lat_max	72.77347092944687

geospatial_lat_min	59.551707075938374
geospatial_lat_units	degrees_north
geospatial_lon_max	-155.3033689715619
geospatial_lon_min	-159.26797154657882
geospatial_lon_units	degrees_east
granule_type	ATL11
hdfversion	HDF5 1.14.4
history	2025-09-07T07:54:54.018384Z
identifier_file_uuid	2f124dfe-e73a-3520-8fbb-2861a1b1a47a
identifier_product_doi	doi:10.5067/ATLAS/ATL11.007
identifier_product_doi_authority	http://dx.doi.org
identifier_product_format_version	3.0
identifier_product_type	ATL11
institution	National Aeronautics and Space Administration (NASA)
instrument	ATLAS > Advanced Topographic Laser Altimeter System
keywords	EARTH SCIENCE > CRYOSPHERE > GLACIERS/ICE SHEETS > GLACIER ELEVATION/ICE SHEET ELEVATION > NONE > NONE > NONE
keywords_vocabulary	NASA/GCMD Science Keywords
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	ICESat-2 > Ice, Cloud, and land Elevation Satellite-2
processing_level	3B
project	ICESat-2 > Ice, Cloud, and land Elevation Satellite-2
publisher_email	nsidc@nsidc.org

publisher_name	NSIDC DAAC > NASA National Snow and Ice Data Center Distributed Active Archive Center
publisher_url	http://nsidc.org/daac/
references	http://nsidc.org/data/icesat2/data.html
source	Spacecraft
spatial_coverage_type	Horizontal
standard_name_vocabulary	CF-1.6
summary	The purpose of ATL11 is to provide an ICESat-2 satellite cycle summary of heights and height changes of land-based ice and will be provided as input to ATL14 and ATL15, gridded estimates of heights and height-changes.
time_coverage_duration	191116574.66596866
time_coverage_end	2025-04-18T08:13:11.000000Z
time_coverage_start	2019-03-29T08:15:03.000000Z
time_type	CCSDS UTC-A

1.2 Group: /METADATA

ISO19115 Structured Metadata Represented within HDF5

1.2.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
iso_19139_dataset_xml	STRING(1) -		ISO 19139 Dataset XML
iso_19139_series_xml	STRING(1) -		ISO 19139 Series XML

1.3 Group: /METADATA/AcquisitionInformation

1.4 Group: /METADATA/AcquisitionInformation/lidar

ATLAS on ICESat-2 determines the range between the satellite and the Earth's surface by measuring the two-way time delay of short pulses of laser light that it transmits in six beams. It is different from previous operational ice-sheet altimeters in that it is a photon-counting LIDAR.

ATLAS records a set of arrival times for individual photons, which are then analyzed to derive surface, vegetation, and cloud properties. ATLAS has six beams arranged in three pairs, so that it samples each of three reference pair tracks with a pair of beams; ATLAS transmits pulses at 10 kHz, giving approximately one pulse every 0.7 m along track; ATLAS's expected pointing control will be better than 90 m RMS.

1.4.1 Attributes

identifier	ATLAS
pulse_rate	10000 pps
type	Laser Altimeter
wavelength	532 nm

1.5 Group: /METADATA/AcquisitionInformation/lidarDocument

1.5.1 Attributes

edition	Pre-Release
publicationDate	12/31/17
title	A document describing the ATLAS instrument will be provided by the ICESat-2 Project Science Office.

1.6 Group: /METADATA/AcquisitionInformation/platform

Ice, Cloud, and land Elevation Satellite-2

1.6.1 Attributes

identifier	ICESat-2
type	Spacecraft

1.7 Group: /METADATA/AcquisitionInformation/platformDocument

1.7.1 Attributes

edition	31-Dec-16

publicationDate	31-Dec-16
title	The Ice, Cloud, and land Elevation Satellite-2 (ICESat-2): Science requirements, concept, and implementation. Thorsten Markus, Tom Neumann, Anthony Martino, Waleed Abdalati, Kelly Brunt, Beata Csatho, Sinead Farrell, Helen Fricker, Alex Gardner, David Harding, Michael Jasinski, Ron Kwok, Lori Magruder, Dan Lubin, Scott Luthcke, James Morison, Ross Nelson, Amy Neuenschwander, Stephen Palm, Sorin Popescu, CK Shum, Bob E. Schutz, Benjamin Smith, Yuekui Yang, Jay Zwally. http://dx.doi.org/10.1016/j.rse.2016.12.029

1.8 Group: /METADATA/DataQuality

1.8.1 Attributes

scope	NOT_SET

1.9 Group: /METADATA/DataQuality/CompletenessOmission

1.9.1 Attributes

evaluationMethodType	directInternal
measureDescription	TBD
nameOfMeasure	TBD
unitofMeasure	TBD
value	NOT_SET

1.10 Group: /METADATA/DataQuality/DomainConsistency

1.10.1 Attributes

evaluationMethodType	directInternal
measureDescription	TBD
nameOfMeasure	TBD

unitofMeasure	TBD
value	NOT_SET

1.11 Group: /METADATA/DatasetIdentification

1.11.1 Attributes

VersionID	SET_BY_PGE
abstract	This data set provides time series of land-ice surface heights derived from the ICESat-2 ATL06 Land Ice Height product. It is a spatially organized product that allows easy access to height-change information derived from ICESat-2 observations.
characterSet	utf8
creationDate	SET_BY_PGE
credit	The software that generates the ATL11 product was designed and implemented within the ICESat-2 Science Investigator-led Processing System at the NASA Goddard Space Flight Center in Greenbelt, Maryland.
fileName	SET_BY_PGE
language	eng
originatorOrganizationName	GSFC I-SIPS > ICESat-2 Science Investigator-led Processing System
purpose	The purpose of ATL11 is to provide an ICESat-2 satellite cycle summary of heights and height changes of land-based ice and will be provided as input to ATL14 and ATL15, gridded estimates of heights and height-changes.
shortName	ATL11
spatialRepresentationType	along-track
status	onGoing
topicCategory	geoscientificInformation
uuid	SET_BY_PGE

1.12 Group: /METADATA/Extent

1.12.1 Attributes

eastBoundLongitude	-155.3033689715619
northBoundLatitude	72.77347092944687
rangeBeginningDateTime	2019-03-29T08:15:03.000000Z
rangeEndingDateTime	2025-04-18T08:11:17.665969Z
southBoundLatitude	59.551707075938374
westBoundLongitude	-159.26797154657882

1.13 Group: /METADATA/Lineage

1.14 Group: /METADATA/Lineage/ANC36-11

1.14.1 Attributes

fileName	DsESDTAtATL11.001.series.xml
shortName	ANC36-11
uuid	5BFCCB48-D68E-4897-92C6-389DE6A1C32B
version	001

1.15 Group: /METADATA/Lineage/ANC38-11

1.15.1 Attributes

fileName	DsESDTAtATL11.001.dataset.xml
shortName	ANC38-11
uuid	95BF65A6-F1E7-445E-9E94-ADD030917038

version	001

1.16 Group: /METADATA/Lineage/ATL06

ICESat-2 ATLAS Land Ice

1.16.1 Attributes

end_cycle	SET_BY_PGE
end_geoseg	SET_BY_PGE
end_orbit	SET_BY_PGE
end_region	SET_BY_PGE
end_rgt	SET_BY_PGE
fileName	SET_BY_PGE
shortName	SET_BY_PGE
start_cycle	SET_BY_PGE
start_geoseg	SET_BY_PGE
start_orbit	SET_BY_PGE
start_region	SET_BY_PGE
start_rgt	SET_BY_PGE
uuid	SET_BY_PGE
version	SET_BY_PGE

1.17 Group: /METADATA/Lineage/Control

Exact command line execution of ICESat-2/ATL11 algorithm providing all of the conditions required for each individual run of the software.

1.17.1 Attributes

control	SET_BY_PGE
shortName	CNTL
version	1

1.18 Group: /METADATA/ProcessStep

1.19 Group: /METADATA/ProcessStep/Browse

1.19.1 Attributes

identifier	SET_BY_PGE
processDescription	Browse processing is performed for each granule SIPS produces. The browse utility reads data from the granule and produces browse images as defined in the respective product ATBD. The utility then embeds each browse image into the product within the /Browse group.
runTimeParameters	SET_BY_PGE
softwareDate	SET_BY_PGE
softwareTitle	SET_BY_PGE
softwareVersion	SET_BY_PGE
stepDateTime	SET_BY_PGE

1.20 Group: /METADATA/ProcessStep/Metadata

1.20.1 Attributes

identifier	atlas_meta
processDescription	Metadata information is processed by the metadata utility for each granule produced by SIPS. During PGE processing, dynamic metadata are written to the product. Additional static information is provided with the metadata template. The metadata utility reads ISO Dataset and Series metadata files and updates the product with static information from within those files. The utility then merges the static and dynamic metadata to creates output ISO19139 Dataset and Series XML files. Finally the utility reads the ISO19139 Dataset and Series XML files into memory and stores the textual representations as attributes attached to the /METADATA group.
runTimeParameters	SET_BY_PGE

softwareDate	Sep 3 2025
softwareTitle	Creates ATLAS XML metadata files
softwareVersion	Version 5.1.3
stepDateTime	2025-09-07T11:54:54.000000Z

1.21 Group: /METADATA/ProcessStep/PGE

1.21.1 Attributes

ATBDDate	12/04/2019
ATBDTitle	Algorithm Theoretical Basis Document (ATBD) For Land-Ice Along-Track Products Part 2: Land-ice H(t)/ATL11
ATBDVersion	N/A
documentDate	Feb 2020
documentation	ATLAS Science Algorithm Software Design Description (SDD) - Volume 9 (atlas_l3a_is)
identifier	atlas_l3b_is
processDescription	Computes surface heights for each beam, along and across-track slopes calculated for beam pairs.
runTimeParameters	SET_BY_PGE
softwareDate	SET_BY_PGE
softwareTitle	ASAS L3B Land Ice PGE
softwareVersion	SET_BY_PGE
stepDateTime	SET_BY_PGE

1.22 Group: /METADATA/ProcessStep/QA

1.22.1 Attributes

identifier	atl11_qa_util

processDescription	QA processing is performed by an external utility on each granule produced by SIPS. The utility reads the granule, performs both generic and product-specific quality-assessment calculations, and writes a text-based quality assessment report. The name and creation data of this report are identified within the QADatasetIdentification metadata
runTimeParameters	SET_BY_PGE
softwareDate	SET_BY_PGE
softwareTitle	ATL11 QA Utility
softwareVersion	SET_BY_PGE
stepDateTime	SET_BY_PGE

1.23 Group: /METADATA/ProductSpecificationDocument

1.23.1 Attributes

ShortName	ATL11_SDP
characterSet	utf8
edition	v4.3
language	eng
publicationDate	Feb 2020
title	ICESat-2-SIPS-SPEC-4260 - ATLAS Science Algorithm Standard Data Product (SDP) Volume 5 (ATL06).

1.24 Group: /METADATA/QADatasetIdentification

1.24.1 Attributes

abstract	An ASCII product that contains statistical information on data product results. These statistics enable data producers and users to assess the quality of the data in the data product granule
creationDate	SET_BY_PGE

fileName	SET_BY_PGE

1.25 Group: /METADATA/SeriesIdentification

1.25.1 Attributes

VersionID	SET_BY_PGE
abstract	This data set provides time series of land-ice surface heights derived from the ICESat-2 ATL06 Land Ice Height product. It is a spatially organized product that allows easy access to height-change information derived from ICESat-2 observations.
characterSet	utf8
credit	The software that generates the ATL11 product was designed and implemented within the ICESat-2 Science Investigator-led Processing System at the NASA Goddard Space Flight Center in Greenbelt, Maryland.
format	HDF
formatVersion	5
identifier_product_DOI	doi:10.5067/ATLAS/ATL11.007
language	eng
longName	ATLAS/ICESat-2 L3B Slope-Corrected Land Ice Height Time Series
maintenanceAndUpdateFrequency	asNeeded
maintenanceDate	SET_BY_META
mission	ICESat-2 > Ice, Cloud, and land Elevation Satellite-2
pointOfContact	NSIDC DAAC > NASA National Snow and Ice Data Center Distributed Active Archive Center
purpose	The purpose of ATL11 is to provide an ICESat-2 satellite cycle summary of heights and height changes of land-based ice and will be provided as input to ATL14 and ATL15, gridded estimates of heights and height-changes.
resourceProviderOrganizationName	National Aeronautics and Space Administration (NASA)

revisionDate	2023-05-31
shortName	ATL11
status	onGoing
topicCategory	geoscientificInformation

1.26 Group: /ancillary_data

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

1.26.1 Attributes

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

1.26.2 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
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

Name Standard Name	Type(Dims) FillValue	Units	Description
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
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

Name Standard Name	Type(Dims) FillValue	Units	Description
			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) -	seconds/cell	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
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

Name Standard Name	Type(Dims) FillValue	Units	Description
			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
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

Name Standard Name	Type(Dims) FillValue	Units	Description
			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

1.27 Group: /orbit_info

Contains orbit information.

1.27.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
bounding_polygon_dim1	INTEGER(:) -	1	Polygon extent vertex count Source: model
bounding_polygon_lat1	FLOAT(:) -	degrees North	Polygon extent vertex latitude Source: model
bounding_polygon_lon1	FLOAT(:) -	degrees East	Polygon extent vertex longitude Source: model

1.28 Group: /ptX

data for pair track

1.28.1 Attributes

ATL06_xover_field_list	delta_time,h_li,h_li_sigma,latitude,longitude,atl06_quality_summary,segment_id,x_atc,y_atc,dh_fit_dx,rgt,cycle_number,BP,LR,ref_azimuth,ref_coelv,seg_azimuth,spot,sigma_geo_xt,sigma_geo_at,sigma_geo_h,dac,tide_ocean
L_search_AT	60
L_search_XT	65

N_coeffs	8
N_poly_coeffs	8
N_search	3.0
ReferenceGroundTrack	SET_BY_PGE
beam_pair	1
beam_spacing	90
equatorial_radius	6378137
first_cycle	SET_BY_PGE
last_cycle	SET_BY_PGE
max_fit_iterations	20
pair_yatc_ctr_tol	1000
polar_radius	6356752.3
poly_max_degree_AT	3
poly_max_degree_XT	2
seg_atc_spacing	100
seg_number_skip	3.0
seg_sigma_threshold_min	0.05
t_scale	31557600.0
xy_scale	100.0

1.28.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
cycle_number	INTEGER_1(:) -	counts	cycle number Source: ATL06
delta_time	DOUBLE(:, :) INVALID_R8B	seconds since 2018-01-01	Mean number of GPS seconds since the ATLAS SDP epoch Source: ATL06

Name Standard Name	Type(Dims) FillValue	Units	Description
h_corr	FLOAT(:, :) INVALID_R4B	meters	the mean corrected height Source: derived, ATL11 algorithm
h_corr_sigma	FLOAT(:, :) INVALID_R4B	meters	the formal error in the corrected height Source: derived, ATL11 algorithm
h_corr_sigma_systematic	FLOAT(:, :) INVALID_R4B	meters	the magnitude of all errors that might be correlated at scales larger than a single fit center (e.g. pointing errors, GPS errors, etc) Source: derived, ATL11 algorithm
latitude	DOUBLE(:) INVALID_R8B	degrees North	center latitude based on selected segments Source: ATL06 segments
longitude	DOUBLE(:) INVALID_R8B	degrees East	center longitude based on selected segments Source: ATL06 segments
quality_summary	INTEGER_1(:, :) INVALID_I1B	1	Summary flag: zero indicates high-quality cycles: where min_signal_selection_source <=1 and min_SNR_significance < 0.02, and ATL06_summary_zero_count >0. Source: derived, ATL11 algorithm
ref_pt	INTEGER(:) -	counts	The reference point is the segment_id corresponding to the center of the ATL06 data used for each ATL11 point. Segment_id is counted from the equator crossing of the RGT, with one segment every 20m. Source: ATL06

1.29 Group: /ptX/cycle_stats

Parameters describing the input data for each cycle at each reference point

1.29.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
atl06_summary_zero_count	INTEGER_1(:, :) INVALID_I1B	counts	Number of segments with ATL06_quality_summary==0 (0 indicates the best-quality data) Source: ATL06
bsnow_conf	INTEGER_1(:, :) INVALID_I1B	1	Maximum bsnow_conf flag from ATL06: indicates the greatest (among segments) confidence flag for presence of blowing snow for each cycle Source: ATL06

Name Standard Name	Type(Dims) FillValue	Units	Description
bsnow_h	FLOAT(:, :) INVALID_R4B	meters	Weighted-average blowing snow layer height for each cycle Source: ATL06
cloud_flg_asr	INTEGER_1(:, :) INVALID_I1B	1	Minimum apparent-surface-reflectance -based cloud flag from ATL06: Flag indicates confidence that clouds with OT > 0.2 are present in the lower 3 km of the atmosphere based on ATL09 Source: ATL06
cloud_flg_atm	INTEGER_1(:, :) INVALID_I1B	1	Minimum cloud flag from ATL06: Flag indicates confidence that clouds with OT > 0.2 are present in the lower 3 km of the atmosphere based on ATL09 Source: ATL06
dac	FLOAT(:, :) INVALID_R4B	meters	Weighted-average dynamic atmosphere correction for each pass Source: ATL06
dh_geoloc	FLOAT(:, :) INVALID_R4B	meters	Height correction to correct for Antarctic geolocation bias Source: derived, ATL11 algorithm
h_mean	FLOAT(:, :) INVALID_R4B	meters	Weighted-average of surface heights, not including the correction for the reference surface Source: ATL06
h_rms_misfit	FLOAT(:, :) INVALID_R4B	meters	Weighted-average RMS misfit between PE heights and along-track land-ice segment fit Source: derived, ATL11 algorithm
min_signal_selection_source	INTEGER_1(:, :) INVALID_I1B	1	Minimum of the ATL06 signal_selection_source value (indicates the highest-quality segment in the cycle) Source: ATL06
min_snr_significance	FLOAT(:, :) INVALID_R4B	1	Minimum of SNR_significance (indicates the quality of the best segment in the cycle) Source: ATL06
r_eff	FLOAT(:, :) INVALID_R4B	1	Weighted-average effective, uncorrected reflectance for each pass. Source: derived, ATL11 algorithm
seg_count	INTEGER(:, :) INVALID_I4B	counts	Number of segments marked as valid for each cycle. Equal to 0 for those cycles not included in the reference-surface shape fit. Source: ATL06
sigma_geo_at	FLOAT(:, :) INVALID_R4B	meters	Root-mean-weighted-square-average local-coordinate x horizontal geolocation error for each

Name Standard Name	Type(Dims) FillValue	Units	Description
			cycle due to PPD and POD Source: ATL06
sigma_geo_h	FLOAT(:, :) INVALID_R4B	meters	Root-mean-weighted-square-average total vertical geolocation error due to PPD and POD Source: ATL06
sigma_geo_xt	FLOAT(:, :) INVALID_R4B	meters	Root-mean-weighted-square-average local-coordinate y horizontal geolocation error for each cycle due to PPD and POD Source: ATL06
tide_ocean	FLOAT(:, :) INVALID_R4B	meters	Weighted-average ocean tide for each pass Source: ATL06
x_atc	DOUBLE(:, :) INVALID_R8B	meters	weighted average of pair-center RGT x coordinates for each cycle Source: ATL06
y_atc	DOUBLE(:, :) INVALID_R8B	meters	weighted mean of pair-center RGT y coordinates for each cycle Source: ATL06

1.30 Group: /ptX/ref_surf

Parameters describing the reference surface at each reference point

1.30.1 Attributes

poly_exponent_x	1,0,2,1,0,3,2,1
poly_exponent_y	0,1,0,1,2,0,1,2

1.30.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
at_slope	FLOAT(:) INVALID_R4B	1	Mean along-track component of the slope of the reference surface within 50 m of the fit center Source: derived, ATL11 algorithm
complex_surface_flag	INTEGER_1(:) INVALID_I1B	1	0 indicates that normal fitting was attempted, 1 indicates that the signal selection algorithm rejected too many repeats, and only a linear fit was attempted Source: derived, ATL11 algorithm

Name Standard Name	Type(Dims) FillValue	Units	Description
curvature	FLOAT(:) INVALID_R4B	1	the RMS of the slope of the fit polynomial within 50 m of the fit center Source: derived, ATL11 algorithm
deg_x	INTEGER_1(:) INVALID_I1B	counts	Maximum degree of non-zero polynomial components in x Source: derived, ATL11 algorithm
deg_y	INTEGER_1(:) INVALID_I1B	counts	Maximum degree of non-zero polynomial components in y Source: derived, ATL11 algorithm
dem_h	FLOAT(:) INVALID_R4B	meters	DEM elevation, derived from ATL06 /gtxx/atl06_segments/dem/dem_h Source: ATL06
e_slope	FLOAT(:) INVALID_R4B	1	the mean East-component slope for the reference surface within 50 m of the fit center Source: derived, ATL11 algorithm
fit_quality	INTEGER_1(:) INVALID_I1B	1	Indicates quality of the fit: 0: no problem identified, 1: One or more polynomial coefficients has an error of 10 or larger, 2: One or more surface slope components is greater than 0.02, 3: both 1 and 2 Source: derived, ATL11 algorithm
geoid_free2mean	FLOAT(:) INVALID_R4B	meters	Additive value to convert geoid heights from the tide-free system to the mean-tide system, derived from ATL06 /gtxx/atl06_segments/dem/geoid_free2mean Source: ATL06
geoid_h	FLOAT(:) INVALID_R4B	meters	Geoid height above WGS-84 reference ellipsoid in the tide-free system, derived from ATL06 /gtxx/atl06_segments/dem/geoid_h Source: ATL06
misfit_chi2r	FLOAT(:) INVALID_R4B	meters	misfit chi square, divided by the number of degrees in the solution Source: derived, ATL11 algorithm
misfit_rms	FLOAT(:) INVALID_R4B	meters	RMS misfit for the surface-polynomial fit Source: derived, ATL11 algorithm
n_slope	FLOAT(:) INVALID_R4B	1	the mean North-component slope for the reference surface within 50 m of the fit center Source: derived, ATL11 algorithm
poly_coeffs	FLOAT(:, :) INVALID_R4B	1	polynomial coefficients (up to degree 3), for polynomial components scaled by 100 m Source: derived, ATL11 algorithm

Name Standard Name	Type(Dims) FillValue	Units	Description
poly_coeffs_sigma	FLOAT(:, :) INVALID_R4B	1	formal errors for the polynomial coefficients Source: derived, ATL11 algorithm
poly_exponent_x	INTEGER_1(:) -	counts	exponents for the x factors in the surface polynomial Source: derived, ATL11 algorithm
poly_exponent_y	INTEGER_1(:) -	counts	exponents for the y factors in the surface polynomial Source: derived, ATL11 algorithm
rgt_azimuth	FLOAT(:) INVALID_R4B	degrees	Reference track azimuth, in degrees east of local north Source: ATL06
x_atc	DOUBLE(:) INVALID_R8B	meters	Along-track coordinate of the reference point, measured along the RGT from its first equator crossing. Source: ATL06
xt_slope	FLOAT(:) INVALID_R4B	1	Mean cross-track component of the slope of the reference surface within 50 m of the fit center Source: derived, ATL11 algorithm
y_atc	DOUBLE(:) INVALID_R8B	meters	Across-track coordinate of the reference point, measured along the RGT from its first equator crossing. Source: ATL06

1.31 Group: /quality_assessment

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

1.31.1 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.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: Operations Flags: 0()=PASS, 1()=FAIL