

1.0 DATA DICTIONARY

The following subsections list the data content of ATL16. 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	ATL16
title	SET_BY_META
level	L3B
description	The ICESat-2 ATL16 atmosphere gridded standard data product reports weekly global cloud fraction, combined global cloud fraction, global aerosol fraction, global clear fraction, global total column optical depth over all surfaces, expanded global total column optical depth over all surfaces, polar cloud fraction, polar blowing snow frequency, south polar surface diamond dust frequency, global and polar ASR cloud fraction, global and polar apparent surface reflectivity, global and polar ground detection frequency, global folded cloud frequency, unique global and polar observation counts, atmosphere gridded parameter statistical values, and global and polar projection images of the atmosphere gridded parameters.
Conventions	CF-1.8
citation	SET_BY_META
contributor_name	Thomas A Neumann (thomas.neumann@nasa.gov), Stephen P Palm (stephen.p.palm@nasa.gov), Suneel K Bhardwaj (suneel.k.bhardwaj@nasa.gov), David W Hancock III (david.w.hancock@nasa.gov), E Thomas Northam (e.thomas.northam@nasa.gov)
contributor_role	Project Scientist, Atmosphere Scientist, SDMS Data Producer, Ground System Manager, Developer
creator_name	SET_BY_META
date_created	SET_BY_PGE
date_type	UTC
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	ATL16
hdfversion	SET_BY_PGE
history	SET_BY_PGE
identifier_file_uuid	SET_BY_PGE
identifier_product_doi	10.5067/ATLAS/ATL16.001
identifier_product_doi_authority	http://dx.doi.org
identifier_product_format_version	SET_BY_PGE
identifier_product_type	ATL16
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	L3B
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
combined_global_cloud_frac	FLOAT(:, :) INVALID_R4B	1	The combined global cloud fraction two-dimensional atmospheric gridded parameter. For each cloud observation count global grid cell this represents the number of 25 Hz (high-rate profile) observations with at least one cloud layer from the Direct Dimension Algorithm (DDA) (layer_attr (,) = 1 within cloud_flag_atm () layers) OR when no DDA cloud layer is detected, a 25 Hz Apparent Surface Reflectivity (ASR) cloud probability is determined to be cloud when (asr_cloud_probability () >= the control constant ASR_CLOUD_THRESHOLD (default=70)). The gridded parameter represents the ratio of the clouds counted from DDA or ASR to the number of all 25 Hz (high-rate profile) observations (global_cloud_aerosol_obs_grid (i,j)) in the cell. The gridded combined global cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (global_cloud_aerosol_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. The asr_cloud_probability is a representation of cloud occurrence based on apparent surface reflectivity magnitude from ASR processing. A combined cloud

Name Standard Name	Type(Dims) FillValue	Units	Description
			fraction value of 0.0 represents a totally cloud free grid cell; a combined cloud fraction value of 1.0 indicates the grid cell is completely covered with clouds. Grid array organization: combined_global_cloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: combined_global_cloud_frac (120,60), type: floating point. Reference: combined_global_cloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "combined_global_cloud_frac_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to include folded clouds in cloud layer counting (numerator grid cell array running summation). Either the first occurrence of a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. In the absence of a DDA detected cloud layer (layer_attr(.)=10) or a DDA detected folded cloud layer (layer_attr(.)=11 or cloud_fold_flag()=2 or =3), or an expected folded cloud layer (cloud_fold_flag()=1

Name Standard Name	Type(Dims) FillValue	Units	Description
			or =3), the counting logic moves to test for the presence of ASR clouds. Source: L3B ATM ATBD, [3.1.2] Combined Global Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
crs_latlon	INTEGER_1 -		Coordinate Reference System for WGS84 Longitude/Latitude
data_qa_flag	INTEGER_1(1) -	1	The data quality flag scalar parameter. This is a TBD flag that may be used to indicate data quality. Source: L3B ATM ATBD, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
delta_time_beg time	DOUBLE(1) -	seconds since 2018-01-01	The start time scalar parameter (start_time). The start time/date of the data used to make the product. Number of GPS seconds since the ATLAS SDP epoch at the beginning of the data collection. 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. Type: double precision. Source: L3B ATM ATBD, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
delta_time_end time	DOUBLE(1) -	seconds since 2018-01-01	The end time scalar parameter (end_time). The end time/date of the data used to make the product. Number of GPS seconds since the ATLAS SDP epoch at the end of the data collection. 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. Type: double precision. Source: L3B ATM ATBD, [5.0] Product

Name Standard Name	Type(Dims) FillValue	Units	Description
			Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
exp_tcod_obs_grid	FLOAT(:, :) -	1	The expanded global total column optical depth observation count (formerly only over water or ocean, now over all surface types) two-dimensional gridded parameter. The number of observations used to compute the averaged expanded global total column optical depth over all surfaces. This gridded parameter is "expanded" to count not only valid surface return over all surface types (column_od_asr_qf () .ne. 0 for no_signal) column optical depth (column_od_asr () .ne. INVALID and column_od_asr () > 0.0) 25 Hz (high-rate profile) observations plus the calculated estimated cloud reflectance replacement values for the INVALID no-signal profile observations in each grid cell are used to compute the cell average expanded global over all surface types total column optical depth (expanded_global_column_od (i,j)). The ATL09 profile parameter surface type (surf_type(type,)=1, for type=(land, ocean, sea ice, land ice, inland water)) and the INVALID column_od_asr () are the conditions to calculate the estimated cloud column optical depth using the control parameter gen_cloud_od_max, the estimate being a replacement for the INVALID ASR observation. Grid array organization: exp_tcod_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the weekly global gridded array dimension is: exp_tcod_obs_grid (120,60), type: floating point. Reference: exp_tcod_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. The expanded global observation counts are applicable to the atmosphere gridded parameter: expanded_global_column_od (i,j). Source: L3B ATM ATBD [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images

Name Standard Name	Type(Dims) FillValue	Units	Description
expanded_global_column_od	FLOAT(:, :) INVALID_R4B	1	The weekly averaged expanded global total column optical depth is a two-dimensional atmospheric gridded parameter. The core is based on the original global (over water) total column optical depth. Required 25 Hz (high-rate profile) ATL09 inputs are: 1) total column optical depth (column_od_asr ()) estimated from apparent surface reflectance (ASR) and assumed actual surface reflectance, and 2) total column optical depth from ASR quality flag (column_od_asr_qf ()), the reflecting surface type; both from the L3A ATM high-rate profile processing. ASR column optical depth profile values are accumulated and counted for valid, over all-surface types (i.e., land, sea ice, land ice, water). ASR column optical depth profile values are INVALID when there is no surface signal indicated by the quality flag equal zero (i.e., (column_od_asr_qf () = 0, no signal), and are rejected. The expanded aspect of this parameter over the global total column optical depth parameter are from the implementation of a randomly estimated cloud reflectance replacement value as a substitution for the no-signal ASR column optical depth profile (i.e., (column_od_asr () = INVALID). The expanded calculation requires an additional ATL09 profile, the surface type (i.e., surf_type (type,)), where type= land, ocean, sea ice, land ice, inland water), and the control parameter, generate cloud optical depth maximum (gen_cloud_od_max). In the previous version the randomly estimated cloud reflectance was calculated only when the INVALID column_od_asr () occurred, and surface type indicated an over-ocean surface type (i.e., surf_type (ocean,) = 1), now performs the calculation for any surface type (i.e., surf_type (type,) = 1). The calculation is a formula using gen_cloud_od_max and a normally distributed (Gaussian) random number from 0.0 to 1.0. A representation of the formula is: estimated_cloud_reflectance = normal_random(0,1)*(gen_cloud_od_max-3)+3. Each parameter grid cell is produced when the number of valid observations in the cell is equal to or greater than the minimum number of observations required for each grid cell (exp_tcod_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The estimated replacement value is intended to be a placeholder for

Name Standard Name	Type(Dims) FillValue	Units	Description
			improved column optical depth histogram values obtained from MODIS or other satellite-based estimates. The numerical range of the randomly estimated cloud reflectance is 3.0 to 35.0. A 0.0 to 25.0 value range constraint will be applied to the expanded global image only and is not applied to the gridded parameter values. Grid array organization: expanded_global_column_od (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: expanded_global_column_od (120,60), type: floating point. Reference: expanded_global_column_od (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "expanded_global_column_od_img" in the ATL16 product. The applicable expanded global observation counts for this atmosphere gridded parameter are available from: exp_tcod_obs_grid (i,j). Expected value range: minimum: 0.0, maximum: 35.0. Maximum value may exceed 25.0 (e.g., 29.364258). Image will be limited to the range of 0.0 to 25.0. Source: L3B ATM ATBD, [3.2.2] Expanded Global Total Column Optical Depth, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_aerosol_frac	FLOAT(:, :) INVALID_R4B	1	The global aerosol fraction two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one aerosol layer (layer_attr (.) = 2 within cloud_flag_atm (.) layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded global aerosol fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell ($\Rightarrow$ obs_minimum); otherwise set to INVALID. The ATL09 required number of

Name Standard Name	Type(Dims) FillValue	Units	Description
			layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: global_aerosol_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the global gridded array dimension is: global_aerosol_frac (120,60), type: floating point. Reference: global_aerosol_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_aerosol_frac_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.3] Global Aerosol Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_asr	FLOAT(:, :) INVALID_R4B	1	The global average apparent surface reflectance (ASR) two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the summation of the detected surface signal apparent surface reflectivity 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) to the number of detected surface signal ASR 25 Hz (high-rate profile) observations (global_asr_obs_grid (i,j)) in the cell. The gridded average global ASR values are produced when the number of detected surface signal ASR 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (global_asr_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. ASR represents the true surface reflectivity modified by the two-way atmospheric transmission. Generally a number between 0.0 and 1.0. ASR is related to the ratio of the received energy to the transmitted energy, assuming a

Name Standard Name	Type(Dims) FillValue	Units	Description
			Lambertian surface reflectance. The ATL09 required surface signal apparent surface reflectance (apparent_surf_reflec ()) values are determined in the L3A ATM high-rate profile processing. Grid array organization: global_asr (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the gridded array dimension is: global_asr (120,60), type: floating point. Reference: global_asr (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_asr_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_asr_obs_grid (i,j). Expected value range: minimum: 0.0, maximum: 2.5. Maximum value may exceed 1.0 (e.g., 2.46443772). Image will be limited to the range of 0.0 to 1.0. Source: L3B ATM ATBD, [3.4] Apparent Surface Reflectivity (ASR), [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_asr_cloud_frac	FLOAT(:, :) INVALID_R4B	1	The global ASR cloud fraction two-dimensional atmospheric gridded parameter. For each identified ASR cloud probability observation count global grid cell this represents the number of 25 Hz (high-rate profile) observations determined from the ATL09 Apparent Surface Reflectivity (ASR) cloud probability [asr_cloud_probability ()] when the observation equals or exceeds the control constant ASR_CLOUD_THRESHOLD (default=70), [asr_cloud_probability () >= ASR_CLOUD_THRESHOLD]. The gridded parameter represents the ratio of the clouds counted from ASR to the number of all 25 Hz (high-rate profile) observations (glob_cloud_aerosol_obs_grid (i,j)) in the cell. The gridded global ASR cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each

Name Standard Name	Type(Dims) FillValue	Units	Description
			grid cell (glob_asr_cloud_frac_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 asr_cloud_probability is a representation of cloud occurrence based on apparent surface reflectivity magnitude from ASR processing. A global ASR cloud fraction value of 0.0 represents a totally ASR cloud free grid cell; a global ASR cloud fraction value of 1.0 indicates the grid cell is completely covered with clouds from ASR. Grid array organization: global_asr_cloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_asr_cloud_frac (120,60), type: floating point. Reference: global_asr_cloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_asr_cloud_frac_img" in the ATL16 product. The applicable global observation gridded counts for this atmosphere gridded parameter are available from: glob_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.5] Global and Polar ASR Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_asr_obs_grid	FLOAT(:, :) -	1	The global apparent surface reflectance (ASR) observation count two-dimensional gridded parameter. The number of observations used to compute the average global apparent surface reflectance (ASR). Only surface signal detected ASR 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) in each grid cell are used to compute the cell global ASR (global_asr (i,j)). Grid array organization: global_asr_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the weekly global gridded array dimension is: global_asr_obs_grid

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			(120,60), type: floating point . Reference: global_asr_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. The global observation counts are applicable to the atmosphere gridded parameter: global_asr (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_clear_frac	FLOAT(:, :) INVALID_R4B	1	The global clear fraction two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with no detected cloud layers present (clear counter grid) to the number of all 25 Hz (high-rate profile) observations (global_cloud_aerosol_obs_grid (i,j)) in the cell. The clear observation condition is determined from two profile sources: 1) the cloud_flag_atm () = 0 (i.e., no layers detected), or 2) for layers detected (i.e., cloud_flag_atm () > 0) none of the layers detected are cloud layers (layer_attr (,) = 1 (i.e., cloud type) within cloud_flag_atm () layers). The gridded global clear fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (global_cloud_aerosol_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. A clear fraction value of 0.0 represents a totally clouded grid cell; a clear fraction value of 1.0 indicates the grid cell is completely cloud free. Grid array organization: global_clear_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_clear_frac (120,60), type: floating point. Reference: global_clear_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the

Name Standard Name	Type(Dims) FillValue	Units	Description
			gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_clear_frac_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.4] Global Clear Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_cloud_aerosol_obs_grid	FLOAT(:, :) -	1	The global cloud fraction and aerosol fraction observation count two-dimensional gridded parameter. The number of observations used to compute the global cloud fraction and the global aerosol fraction. This number represents all 25 Hz (high-rate profile) observations in each cell. Only 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1) in each grid cell are used to compute the cell global cloud fraction (global_cloud_frac (i,j)). Only 25 Hz (high-rate profile) observations with at least one aerosol layer (layer_attr (,) = 2) in each grid cell are used to compute the cell global aerosol fraction (global_aerosol_frac (i,j)). Given equivalent 25 Hz (high-rate profile) observation counts for cloud fraction and aerosol fraction, this grid array is loaded from the global cloud fraction total observation counts. Grid array organization: global_cloud_aerosol_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the weekly global gridded array dimension is: global_cloud_aerosol_obs_grid (120,60), type: floating point. Reference: global_cloud_aerosol_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. The global observation counts are applicable to these atmosphere gridded parameters: global_cloud_frac (i,j), global_aerosol_frac (i,j), and global_grnd_detect (i,j). Source: L3B ATM ATBD, [3.8]

Name Standard Name	Type(Dims) FillValue	Units	Description
			Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_cloud_frac	FLOAT(:, :) INVALID_R4B	1	The global cloud fraction two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations (global_cloud_aerosol_obs_grid (i,j)) in the cell. The gridded global cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (global_cloud_aerosol_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. A cloud fraction value of 0.0 represents a totally cloud free grid cell; a cloud fraction value of 1.0 indicates the grid cell is completely covered with clouds. Grid array organization: global_cloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_cloud_frac (120,60), type: floating point. Reference: global_cloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_cloud_frac_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to include folded clouds in cloud layer counting

Name Standard Name	Type(Dims) FillValue	Units	Description
			(numerator grid cell array running summation). Either the first occurrence of a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. Excepted folded cloud flag values: 0=no cloud folding is detected, 127=(1) profile latitude falls within northern hemisphere or southern hemisphere latitude limits where clouds are always under 15 km, or (2) profile falls between south polar orbit limit and the southern hemisphere lower limit and outside of the months of July, August, or September, or (3) profile latitude, longitude fall within the South Atlantic Anomaly (SAA) latitude and longitude boundaries and occurs at night. Source: L3B ATM ATBD, [3.1.1] Global Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_column_od	FLOAT(:, :) INVALID_R4B	1	The averaged global total column optical depth (formerly only over water, now over all surface types) two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the summation of the valid over-all-surface types (column_od_asr_qf () .ne. 0 for no_signal) column optical depth 25 Hz (high-rate profile) observations (column_od_asr () .ne. INVALID when column_od_asr_qf () .ne. 0) to the number of valid over-all-surfaces column optical depth from ASR 25 Hz (high-rate profile) observations (tcod_obs_grid (i,j)) in that cell. The averaged global total column optical depth values are produced when

Name Standard Name	Type(Dims) FillValue	Units	Description
			the number of column optical depth 25 Hz (high-rate profile) observations from all surface types is equal to or greater than the minimum number of observations required for each grid cell (tcod_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required total column optical depth (column_od_asr ()) is estimated from the apparent surface reflectance (ASR) and the assumed actual surface reflectance. The required total column optical depth from ASR quality flag (column_od_asr_qf ()) supplies the reflecting surface type for over-all-surface types determination. Both ATL09 parameters are supplied from the L3A ATM high-rate profile processing. The 0.0 to 1.5 value range constraint is applied to the global image, and is not applied to the gridded parameter values. Grid array organization: global_column_od (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_column_od (120,60), type: floating point. Reference: global_column_od (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_column_od_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: tcod_obs_grid (i,j). Expected value range: minimum: 0.0, maximum: 4.0. Maximum value may exceed 3.0 (e.g., 3.0068595409393311). Image will be limited to the range of 0.0 to 1.5. NOTE: for ATL16 version 2, 3, and 4 product deliveries in NSIDC, this gridded parameter is reported for over-water surface type only; with the future ATL17 version 5 product delivery this gridded parameter is now reported over all surface types. Source: L3B ATM ATBD, [3.2.1] Global Total Column Optical Depth, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images

Name Standard Name	Type(Dims) FillValue	Units	Description
global_folded_cloud_freq	FLOAT(:, :) INVALID_R4B	percent	The global folded cloud frequency two-dimensional atmospheric gridded parameter. For each global grid cell this represents the ratio of the unique number of expected or detected folded cloud flag (i.e., cloud layer signal from above 15 km "folded down" to the last (lower) 2-3 km of the 14 km profile range bins) 25 Hz (high-rate profile) observations (cloud_fold_flag () > 0 and cloud_fold_flag () < 127) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded global folded cloud frequency values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The calculation results in a fractional value. The ATL09 required folded cloud flag (cloud_fold_flag ()) is determined from the GMAO GEOS5 FPIT 2D cloud top pressure converted to altitude (from the ANC10 file) and from the DDA cloud layer signal in the L3A ATM high-rate profile processing. Acceptable folded cloud flag values include: 1=GEOS5 FPIT indicated, 2=DDA cloud layer indicated (i.e., the signal magnitude of the last few profile range bins (below the surface) examined for expected signal consistent with cloud folding), 3=both GEOS5 FPIT model data and DDA signal magnitude of the last few range bins indicate cloud folding. Excepted flag values: 0=no folding detected, 127=profile latitude occurs inside of the northern or southern hemisphere constraining latitude limits or the profile latitude/longitude occurs inside the South Atlantic Anomaly boundaries in nighttime (i.e., solar elevation < 0.0) or the profile latitude occurs within the southern hemisphere minimum latitude constraint limit and -90.0 degrees in a month other than July, August, or September. Grid array organization: global_folded_cloud_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_folded_cloud_freq (120,60), type: floating point. Reference: global_folded_cloud_freq (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global

Name Standard Name	Type(Dims) FillValue	Units	Description
			projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_folded_cloud_freq_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.1.7] Global Folded Cloud Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_grid_lat latitude	DOUBLE(:) -	degrees_north	The global grid latitude one-dimensional array parameter, with the latitudes applicable to each global grid cell. ATL09 ATM histogram top latitude (latitude ()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: North=+ values. Range of latitude values: -90.0 to +90.0 degrees, with a step size of global_grid_lat_scale. Grid array organization: global_grid_lat (i), where j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lat_scale = 3.0 degrees, array dimension: global_grid_lat (60), type: double precision. Comprises the y-grid axis for global gridded parameters. Reference: global_grid_lat (1) = -90.0 degrees, at the lower left corner of a global gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_grid_lon longitude	DOUBLE(:) -	degrees_east	The global grid longitude one-dimensional array parameter, with the longitudes applicable to each global grid cell. The ATL09 ATM histogram top longitude (longitude()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: East=+ values. Range of longitude values: -180.0 to +180.0 degrees, with a step size of global_grid_lon_scale. Grid array organization: global_grid_lon (i), where i=longitude index, as per ATBD Section

Name Standard Name	Type(Dims) FillValue	Units	Description
			2.0. Given weekly global_grid_lon_scale = 3.0 degrees, array dimension: global_grid_lon (120), type: double precision. Comprises the x-grid axis for global gridded parameters. Reference: global_grid_lon (1) = -180.0 degrees, at the lower left corner of a global gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
global_grnd_detect	FLOAT(:, :) INVALID_R4B	1	The global ground detection frequency two-dimensional atmospheric gridded parameter. For each global grid cell this represents the number of detected surface signal 25 Hz (high-rate profile) observations (surface_sig () > 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded global ground detection values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The calculation results in a fractional value. The ATL09 required detected surface signal (surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin in the L3A ATM high-rate profile processing. Grid array organization: global_grnd_detect (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly global_grid_lon_scale = 3.0 degrees and global_grid_lat_scale = 3.0 degrees, gridded array dimension: global_grnd_detect (120,60), type: floating point. Reference: global_grnd_detect (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "global_ground_detect_img" in the ATL16 product. The applicable global observation counts for this atmosphere gridded parameter are available from: global_cloud_aerosol_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.5] Ground

Name Standard Name	Type(Dims) FillValue	Units	Description
			Detection Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_asr	FLOAT(:, :) INVALID_R4B	1	The north polar apparent surface reflectance (ASR) two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the summation of the detected surface signal apparent surface reflectivity 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) to the number of detected surface signal ASR 25 Hz (high-rate profile) observations (npolar_asr_obs_grid (i,j)) in the cell. The gridded average north polar ASR values are produced when the number of detected surface signal ASR 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (npolar_asr_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. ASR represents the true surface reflectivity modified by the two-way atmospheric transmission. Generally a number between 0.0 and 1.0. ASR is related to the ratio of the received energy to the transmitted energy, assuming a Lambertian surface reflectance. The ATL09 required surface signal apparent surface reflectance (apparent_surf_reflec ()) values are determined in the L3A ATM high-rate profile processing. Grid array organization: npolar_asr (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly polar_grid_lon_scale = 3.0 degrees and polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the gridded array dimension: is npolar_asr (120,30), type: floating point. Reference: npolar_asr (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_asr_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_asr_obs_grid (i,j). Expected value range: minimum: 0.0, maximum: 2.5.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Maximum value may exceed 1.0 (e.g., 2.087702035). Image will be limited to the range of 0.0 to 1.0. Source: L3B ATM ATBD, [3.4] Apparent Surface Reflectivity (ASR), [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_asr_cloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar ASR cloud fraction two-dimensional atmospheric gridded parameter. For each identified ASR cloud probability observation count north polar grid cell this represents the number of 25 Hz (high-rate profile) observations determined from the ATL09 Apparent Surface Reflectivity (ASR) cloud probability [asr_cloud_probability ()] when the observation equals or exceeds the control constant ASR_CLOUD_THRESHOLD (default=70), [asr_cloud_probability () >= ASR_CLOUD_THRESHOLD]. The gridded parameter represents the ratio of the clouds counted from ASR to the number of all 25 Hz (high-rate profile) observations (npolar_cloud_obs_grid (i,j)) in the cell. The gridded north polar ASR cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (npolar_cloud_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 asr_cloud_probability is a representation of cloud occurrence based on apparent surface reflectivity magnitude from ASR processing. A north polar ASR cloud fraction value of 0.0 represents a totally ASR cloud free grid cell; a north polar ASR cloud fraction value of 1.0 indicates the grid cell is completely covered with clouds from ASR. Grid array organization: npolar_asr_cloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly npolar_grid_lon_scale = 3.0 degrees and npolar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_asr_cloud_frac (120,30), type: floating point. Reference: npolar_asr_cloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north

Name Standard Name	Type(Dims) FillValue	Units	Description
			polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_asr_cloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.5] Global and Polar ASR Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_asr_obs_grid	FLOAT(:, :) -	1	The north polar apparent surface reflectance (ASR) observation count two-dimensional gridded parameter. The number of observations used to compute the average north polar apparent surface reflectance (ASR). Only surface signal detected ASR 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) in each grid cell are used to compute the cell north polar ASR (npolar_asr (i,j)). Grid array organization: npolar_asr_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_asr_obs_grid (120,30), type: floating point. Reference: npolar_asr_obs_grid (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. The north polar observation counts are applicable to the atmosphere gridded parameter: npolar_asr (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_cloud_obs_grid	FLOAT(:, :) -	1	The north polar total cloud fraction observation count two-dimensional gridded parameter. The number of

Name Standard Name	Type(Dims) FillValue	Units	Description
			observations used to compute the north polar total cloud fraction. This number represents all 25 Hz (high-rate profile) observations in each cell. Only 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1) in each grid cell are used to compute the cell north polar total cloud fraction (npolar_totlcloud_frac (i,j)). Grid array organization: npolar_cloud_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_cloud_obs_grid (120,30), type: floating point. Reference: npolar_cloud_obs_grid (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. The north polar observation counts are applicable to these atmosphere gridded parameters: npolar_lowcloud_frac (i,j), npolar_midcloud_frac (i,j), npolar_highcloud_frac (i,j), npolar_totalcloud_frac (i,j), npolar_transcloud_frac (i,j), npolar_opaquecloud_frac (i,j), and npolar_grnd_detect (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_grid_lat latitude	DOUBLE(:) -	degrees_north	The north polar grid latitude one-dimensional array parameter, with the latitudes applicable to each north polar grid cell. ATL09 ATM histogram top latitude (latitude ()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: North=+ values. Range of latitude values: +90.0 down to +60.0 degrees, with a step size of polar_grid_lat_scale. Grid array organization: npolar_grid_lat (j), where j=latitude index, as per ATBD Section 2.0. Given weekly polar_grid_lat_scale = 1.0 degrees, the weekly array dimension is:

Name Standard Name	Type(Dims) FillValue	Units	Description
			npolar_grid_lat (30), type: double precision. Comprises the y-grid axis for north polar gridded parameters. Reference: npolar_grid_lat (1) = +90.0 degrees, at the upper left corner of a north polar gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_grid_lon longitude	DOUBLE(:) -	degrees_east	The north polar grid longitude one-dimensional array parameter, with the longitudes applicable to each north polar grid cell. ATL09 ATM histogram top longitude (longitude ()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: East=+ values. Range of longitude values: -180.0 to +180.0 degrees, with a step size of polar_grid_lon_scale. Grid array organization: npolar_grid_lon (i), where i=longitude index, as per ATBD Section 2.0. Given weekly polar_grid_lon_scale = 3.0 degrees, the weekly array dimension is: npolar_grid_lon (120), type: double precision. Comprises the x-grid axis for north polar gridded parameters. Reference: npolar_grid_lon (1) = -180.0 degrees, at the upper left corner of a north polar gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_grnd_detect	FLOAT(:, :) INVALID_R4B	1	The north polar ground detection frequency two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the number of detected surface signal 25 Hz (high-rate profile) observations (surface_sig () > 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar ground detection values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The calculation results in a fractional value. The ATL09 required

Name Standard Name	Type(Dims) FillValue	Units	Description
			detected surface signal (surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin in the L3A ATM high-rate profile processing. Grid array organization: npolar_grnd_detect (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_grnd_detect (120,30), type: floating point. Reference: npolar_grnd_detect (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_grnd_detect_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.5] Ground Detection Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_highcloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar high (> 8km) cloud fraction two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) that occurs above 8 km from the layer top (layer_top(,) > 8.0 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar high cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()), the layer attribute flag (layer_attr (,)), and the height of the detected layers (layer_top (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM

Name Standard Name	Type(Dims) FillValue	Units	Description
			high-rate profile processing. Grid array organization: npolar_highcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_highcloud_frac (120,30), type: floating point. Reference: npolar_highcloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_highcloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to include folded clouds in cloud layer counting (numerator grid cell array running summation). Either the first occurrence of a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images

Name Standard Name	Type(Dims) FillValue	Units	Description
npolar_hirate_blowing_snow_freq	FLOAT(:,:) INVALID_R4B	percent	The north polar high-rate blowing snow frequency two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of the valid detected blowing snow layer top height 25 Hz (high-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) to the number of valid blowing snow confidence flag (bsnow_con () .ne. INVALID, exceeds the surface not detected value, i.e., bsnow_con () > -3, and is implemented as bsnow_con () => -2) 25 Hz (high-rate profile) observations (npolar_hirate_bsnow_obs_grid (i,j)); the ratio is multiplied by 100.0 to obtain percent. The gridded north polar high-rate blowing snow frequency values are produced when the number of valid blowing snow confidence flag 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (npolar_hirate_bsnow_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required blowing snow height (bsnow_h ()) and blowing snow confidence (bsnow_con ()) values are determined in the L3A ATM high-rate profile processing. Grid array organization: npolar_hirate_blowing_snow_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_hirate_blowing_snow_freq (120,30), type: floating point. Reference: npolar_hirate_blowing_snow_freq (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_hirate_blowing_snow_freq_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_hirate_bsnow_obs_grid (i,j). Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.3.1] Blowing Snow Frequency, [5.0] Product Formats,

Name Standard Name	Type(Dims) FillValue	Units	Description
			Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_hirate_bsnow_obs_grid	FLOAT(:, :) -	1	The north polar high-rate blowing snow observation count two-dimensional gridded parameter. The number of high-rate profile blowing snow observations used in the computation of high-rate blowing snow frequency for the Arctic. For each north polar grid cell this represents the number of valid blowing snow confidence 25 Hz (high-rate profile) observations (bsnow_con () .ne. INVALID), where the high-rate profile blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is actually implemented as bsnow_con () => -2). Only valid detected blowing snow layer top height 25 Hz (high-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) and only valid blowing snow confidence 25 Hz (high-rate profile) observations (bsnow_con () .ne. INVALID), where the high-rate blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is implemented as bsnow_con () => -2) in each grid cell are used to compute the cell north polar high-rate blowing snow frequency (npolar_hirate_blowing_snow_freq (i,j)). Grid array organization: npolar_hirate_bsnow_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_hirate_bsnow_obs_grid (120,30), type: floating point. Reference: npolar_hirate_bsnow_obs_grid (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. The north polar observation counts are applicable to the atmosphere gridded parameter: npolar_hirate_blowing_snow_freq (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of

Name Standard Name	Type(Dims) FillValue	Units	Description
			Gridded and Linear Parameters, Ancillary Data, and Images
npolar_lorate_blowing_snow_freq	FLOAT(:,:) INVALID_R4B	percent	The north polar low-rate blowing snow frequency two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of the valid detected blowing snow layer top height 1 Hz (low-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) to the number of valid blowing snow confidence flag (bsnow_con () .ne. INVALID, exceeds the surface not detected value, i.e., bsnow_con () > -3, and is implemented as bsnow_con () => -2) 1 Hz (low-rate profile) observations (npolar_lorate_bsnow_obs_grid (i,j)); the ratio is multiplied by 100.0 to obtain percent. The gridded north polar low-rate blowing snow frequency values are produced when the number of valid blowing snow confidence flag 1 Hz (low-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (npolar_lorate_bsnow_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required blowing snow height (bsnow_h ()) and blowing snow confidence (bsnow_con ()) values are determined in the L3A ATM low-rate profile processing. Grid array organization: npolar_lorate_blowing_snow_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_lorate_blowing_snow_freq (120,30), type: floating point. Reference: npolar_lorate_blowing_snow_freq (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_lorate_blowing_snow_freq_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_lorate_bsnow_obs_grid (i,j). Value

Name Standard Name	Type(Dims) FillValue	Units	Description
			range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.3.1] Blowing Snow Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_lorate_bsnow_obs_grid	FLOAT(:, :) -	1	The north polar low-rate blowing snow observation count two-dimensional gridded parameter. The number of low-rate profile blowing snow observations used in the computation of low-rate blowing snow frequency for the Arctic. For each north polar grid cell this represents the number of valid blowing snow confidence 1 Hz (low-rate profile) observations (bsnow_con () .ne. INVALID), where the low-rate profile blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is actually implemented as bsnow_con () => -2). Only valid detected blowing snow layer top height 1 Hz (low-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) and only valid blowing snow confidence 1 Hz (low-rate profile) observations (bsnow_con () .ne. INVALID), where the low-rate blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is implemented as bsnow_con () => -2) in each grid cell are used to compute the cell north polar low-rate blowing snow frequency (npolar_lorate_blowing_snow_freq (i,j)). Grid array organization: npolar_lorate_bsnow_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_lorate_bsnow_obs_grid (120,30), type: floating point. Reference: npolar_lorate_bsnow_obs_grid (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. The north polar observation counts are applicable to the atmosphere gridded parameter: npolar_lorate_blowing_snow_freq (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid

Name Standard Name	Type(Dims) FillValue	Units	Description
			Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_lowcloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar low (<= 4km) cloud fraction two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm (,) layers) that occurs below and up to and including 4 km from the layer top (layer_top (,) <= 4.0 within cloud_flag_atm (,) layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar low cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()), the layer attribute flag (layer_attr (,)), and the height of the detected layers (layer_top (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: npolar_lowcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_lowcloud_frac (120,30), type: floating point. Reference: npolar_lowcloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_lowcloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction,

Name Standard Name	Type(Dims) FillValue	Units	Description
			[5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_midcloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar middle (> 4km and <= 8km) cloud fraction two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) that occurs above 4 km and up to and including 8 km from the layer top (layer_top (,) > 4.0 and <= 8.0 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar middle cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()), the layer attribute flag (layer_attr (,)), and the height of the detected layers (layer_top (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: npolar_midcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_midcloud_frac (120,30), type: floating point. Reference: npolar_midcloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_midcloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded

Name Standard Name	Type(Dims) FillValue	Units	Description
			Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_opaquecloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar opaque cloud fraction two-dimensional atmospheric gridded parameter. For each north polar cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) without surface signal detection (surface_sig () = 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar opaque cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The fraction of opaque clouds covering the entire grid cell. Opaque clouds are clouds that inhibit or absorb transmission of downward radiation through the cloud. The cloud layer with opaque characteristics exhibits no surface signal count return (=0.0), indicating that no transmitted photons reached the surface. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder, and the required surface signal (surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin, all in the L3A ATM high-rate profile processing. Grid array organization: npolar_opaquecloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_opaquecloud_frac (120,30), type: floating point. Reference: npolar_opaquecloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_opaquecloud_frac_img" in the ATL16 product. The applicable north polar

Name Standard Name	Type(Dims) FillValue	Units	Description
			observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.2] Transmissive and Opaque Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_totalcloud_frac	FLOAT(:,:) INVALID_R4B	1	The north polar total cloud fraction two-dimensional atmospheric gridded parameter. For each north polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations (npolar_cloud_obs_grid (i,j)) in the cell. The gridded north polar total cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (npolar_cloud_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: npolar_totalcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_totalcloud_frac (120,30), type: floating point. Reference: npolar_totalcloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_totalcloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to

Name Standard Name	Type(Dims) FillValue	Units	Description
			include folded clouds in cloud layer counting (numerator grid cell array running summation). Either the first occurrence of a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
npolar_transcloud_frac	FLOAT(:, :) INVALID_R4B	1	The north polar transmissive cloud fraction two-dimensional atmospheric gridded parameter. For each north polar cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr(.) = 1 within cloud_flag_atm() layers) with surface signal detection (surface_sig() > 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded north polar transmissive cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The fraction of transmissive clouds covering the entire grid cell. Transmissive clouds are clouds that permit or allow transmission of downward radiation through the cloud. The ATL09 required number of layers (cloud_flag_atm()) and the layer attribute flag (layer_attr(.)) are determined from the backscatter profile using the DDA layer finder, and the required detected surface signal

Name Standard Name	Type(Dims) FillValue	Units	Description
			(surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin, all in the L3A ATM high-rate profile processing. Grid array organization: npolar_transcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the north polar latitude range is: +90.0 down to +60.0 degrees, the weekly gridded array dimension is: npolar_transcloud_frac (120,30), type: floating point. Reference: npolar_transcloud_frac (1,1) = (-180.0 degrees longitude, +90.0 degrees latitude), representing the upper left corner of the gridded parameter cell in the north polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "npolar_transcloud_frac_img" in the ATL16 product. The applicable north polar observation counts for this atmosphere gridded parameter are available from: npolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.2] Transmissive and Opaque Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_asr	FLOAT(:, :) INVALID_R4B	1	The south polar apparent surface reflectance (ASR) two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the summation of the detected surface signal apparent surface reflectivity 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) to the number of detected surface signal ASR 25 Hz (high-rate profile) observations (spolar_asr_obs_grid (i,j)) in the cell. The gridded average south polar ASR values are produced when the number of detected surface signal ASR 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (spolar_asr_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. ASR represents the true surface reflectivity modified by the two-way atmospheric transmission. Generally a

Name Standard Name	Type(Dims) FillValue	Units	Description
			number between 0.0 and 1.0. ASR is related to the ratio of the received energy to the transmitted energy, assuming a Lambertian surface reflectance. The ATL09 required surface signal apparent surface reflectance (apparent_surf_reflec ()) values are determined in the L3A ATM high-rate profile processing. Grid array organization: spolar_asr (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly polar_grid_lon_scale = 3.0 degrees and polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension: is spolar_asr (120,30), type: floating point. Reference: spolar_asr (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_asr_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_asr_obs_grid (i,j). Expected value range: minimum: 0.0, maximum: 2.5. Maximum value may exceed 1.0 (e.g., 2.43896603). Image will be limited to the range of 0.0 to 1.0. Source: L3B ATM ATBD, [3.4] Apparent Surface Reflectivity (ASR), [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_asr_cloud_frac	FLOAT(:, :) INVALID_R4B	1	The south polar ASR cloud fraction two-dimensional atmospheric gridded parameter. For each identified ASR cloud probability observation count south polar grid cell this represents the number of 25 Hz (high-rate profile) observations determined from the ATL09 Apparent Surface Reflectivity (ASR) cloud probability [asr_cloud_probability ()] when the observation equals or exceeds the control constant ASR_CLOUD_THRESHOLD (default=70), [asr_cloud_probability () >= ASR_CLOUD_THRESHOLD]. The gridded parameter represents the ratio of the clouds counted from ASR to the number of all 25 Hz (high-rate profile) observations (spolar_cloud_obs_grid (i,j))

Name Standard Name	Type(Dims) FillValue	Units	Description
			in the cell. The gridded south polar ASR cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (spolar_cloud_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 asr_cloud_probability is a representation of cloud occurrence based on apparent surface reflectivity magnitude from ASR processing. A south polar ASR cloud fraction value of 0.0 represents a totally ASR cloud free grid cell; a south polar ASR cloud fraction value of 1.0 indicates the grid cell is completely covered with clouds from ASR. Grid array organization: spolar_asr_cloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given weekly spolar_grid_lon_scale = 3.0 degrees and spolar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_asr_cloud_frac (120,30), type: floating point. Reference: spolar_asr_cloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_asr_cloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.5] Global and Polar ASR Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_asr_obs_grid	FLOAT(:, :) -	1	The south polar apparent surface reflectance (ASR) observation count two-dimensional gridded parameter. The number of observations used to compute the average south polar apparent surface reflectance (ASR). Only surface signal detected ASR 25 Hz (high-rate profile) observations (apparent_surf_reflec () > 0.0) in each grid cell are used to compute the cell south polar ASR (spolar_asr (i,j)). Grid array organization:

Name Standard Name	Type(Dims) FillValue	Units	Description
			spolar_asr_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_asr_obs_grid (120,30), type: floating point. Reference: spolar_asr_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. The south polar observation counts are applicable to the atmosphere gridded parameter: spolar_asr (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_cloud_obs_grid	FLOAT(:, :) -	1	The south polar total cloud fraction observation count two-dimensional gridded parameter. The number of observations used to compute the south polar total cloud fraction. This number represents all 25 Hz (high-rate profile) observations in each cell. Only 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1) in each grid cell are used to compute the cell south polar total cloud fraction (spolar_totlcloud_frac (i,j)). Grid array organization: spolar_cloud_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_cloud_obs_grid (120,30), type: floating point. Reference: spolar_cloud_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. The south polar observation counts are applicable to these atmosphere gridded parameters: spolar_lowcloud_frac (i,j), spolar_midcloud_frac (i,j), spolar_highcloud_frac (i,j),

Name Standard Name	Type(Dims) FillValue	Units	Description
			spolar_totalcloud_frac (i,j), spolar_transcloud_frac (i,j), spolar_opaquecloud_frac (i,j), and spolar_grnd_detect (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_grid_lat latitude	DOUBLE(:) -	degrees_north	The south polar grid latitude one-dimensional array parameter, with the latitudes applicable to each south polar grid cell. ATL09 ATM histogram top latitude (latitude ()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: South=- values. Range of latitude values: -90.0 up to -60.0 degrees, with a step size of polar_grid_lat_scale. Grid array organization: spolar_grid_lat (j), where j=latitude index, as per ATBD Section 2.0. Given weekly polar_grid_lat_scale = 1.0 degrees, the weekly array dimension is: spolar_grid_lat (30), type: double precision. Comprises the y-grid axis for south polar gridded parameters. Reference: spolar_grid_lat (1) = -90.0 degrees, at the lower left corner of a south polar gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_grid_lon longitude	DOUBLE(:) -	degrees_east	The south polar grid longitude one-dimensional array parameter, with the longitudes applicable to each south polar grid cell. ATL09 ATM histogram top longitude (longitude ()) derived from the ATM range window geolocation. Based on WGS84 Earth-centered, Earth-fixed terrestrial reference system and geodetic data. Direction: East=+ values. Range of longitude values: -180.0 to +180.0 degrees, with a step size of polar_grid_lon_scale. Grid array organization: spolar_grid_lon (i), where i=longitude index, as per ATBD Section 2.0. Given weekly polar_grid_lon_scale = 3.0 degrees, the weekly array dimension is: spolar_grid_lon (120), type: double

Name Standard Name	Type(Dims) FillValue	Units	Description
			precision. Comprises the x-grid axis for south polar gridded parameters. Reference: spolar_grid_lon (1) = -180.0 degrees, at the lower left corner of a south polar gridded parameter cell location (i,j) = (1,1). Source: L3B ATM ATBD, [2.0] Global and Polar Grids, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_grnd_detect	FLOAT(:, :) INVALID_R4B	1	The south polar ground detection frequency two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the number of detected surface signal 25 Hz (high-rate profile) observations (surface_sig () > 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar ground detection values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The calculation results in a fractional value. The ATL09 required detected surface signal (surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin in the L3A ATM high-rate profile processing. Grid array organization: spolar_grnd_detect (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_grnd_detect (120,30), type: floating point. Reference: spolar_grnd_detect (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_grnd_detect_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.5] Ground

Name Standard Name	Type(Dims) FillValue	Units	Description
			Detection Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_highcloud_frac	FLOAT(:, :) INVALID_R4B	1	The south polar high (> 8km) cloud fraction two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm (,) layers) that occurs above 8 km from the layer top (layer_top (,) > 8.0 within cloud_flag_atm (,) layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar high cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()), the layer attribute flag (layer_attr (,)), and the height of the detected layers (layer_top (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: spolar_highcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_highcloud_frac (120,30), type: floating point. Reference: spolar_highcloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_highcloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to include folded clouds in cloud layer counting (numerator grid cell array running summation). Either the first occurrence of

Name Standard Name	Type(Dims) FillValue	Units	Description
			a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_hirate_blowing_snow_freq	FLOAT(:,:) INVALID_R4B	percent	The south polar high-rate blowing snow frequency two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of the valid detected blowing snow layer top height 25 Hz (high-rate profile) observations (bsnow_h ()) .ne. INVALID and bsnow_h () > 0.0) to the number of valid blowing snow confidence flag (bsnow_con ()) .ne. INVALID, exceeds the surface not detected value, i.e., bsnow_con () > -3, and is implemented as bsnow_con () => -2) 25 Hz (high-rate profile) observations (spolar_hirate_bsnow_obs_grid (i,j)); the ratio is multiplied by 100.0 to obtain percent. The gridded south polar high-rate blowing snow frequency values are produced when the number of valid blowing snow confidence flag 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (spolar_hirate_bsnow_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required blowing snow height (bsnow_h ()) and blowing snow confidence (bsnow_con ()) values are determined in the L3A ATM high-rate profile processing. Grid array organization:

Name Standard Name	Type(Dims) FillValue	Units	Description
			spolar_hirate_blowing_snow_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_hirate_blowing_snow_freq (120,30), type: floating point. Reference: spolar_hirate_blowing_snow_freq (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_hirate_blowing_snow_freq_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_hirate_bsnow_obs_grid (i,j). Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.3.1] Blowing Snow Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_hirate_bsnow_obs_grid	FLOAT(:, :) -	1	The south polar high-rate blowing snow observation count two-dimensional gridded parameter. The number of high-rate profile blowing snow observations used in the computation of high-rate blowing snow frequency for the Antarctic. For each south polar grid cell this represents the number of valid blowing snow confidence 25 Hz (high-rate profile) observations (bsnow_con () .ne. INVALID), where the high-rate profile blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is actually implemented as bsnow_con () => -2). Only valid detected blowing snow layer top height 25 Hz (high-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) and only valid blowing snow confidence 25 Hz (high-rate profile) observations (bsnow_con () .ne. INVALID), where the high-rate blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is implemented as bsnow_con () => -2) in each grid cell are used to

Name Standard Name	Type(Dims) FillValue	Units	Description
			compute the cell south polar high-rate blowing snow frequency (spolar_hirate_blowing_snow_freq (i,j)). Grid array organization: spolar_hirate_bsnow_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_hirate_bsnow_obs_grid (120,30), type: floating point. Reference: spolar_hirate_bsnow_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. The south polar observation counts are applicable to the atmosphere gridded parameter: spolar_hirate_blowing_snow_freq (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_lorate_blowing_snow_freq	FLOAT(:, :) INVALID_R4B	percent	The south polar low-rate blowing snow frequency two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of the valid detected blowing snow layer top height 1 Hz (low-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) to the number of valid blowing snow confidence flag (bsnow_con () .ne. INVALID, exceeds the surface not detected value, i.e., bsnow_con () > -3, and is implemented as bsnow_con () => -2) 1 Hz (low-rate profile) observations (spolar_lorate_bsnow_obs_grid (i,j)); the ratio is multiplied by 100.0 to obtain percent. The gridded south polar low-rate blowing snow frequency values are produced when the number of valid blowing snow confidence flag 1 Hz (low-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (spolar_lorate_bsnow_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required blowing snow height (bsnow_h ()) and blowing snow

Name Standard Name	Type(Dims) FillValue	Units	Description
			confidence (bsnow_con ()) values are determined in the L3A ATM low-rate profile processing. Grid array organization: spolar_lorate_blowing_snow_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_lorate_blowing_snow_freq (120,30), type: floating point. Reference: spolar_lorate_blowing_snow_freq (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_lorate_blowing_snow_freq_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_lorate_bsnow_obs_grid (i,j). Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.3.1] Blowing Snow Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_lorate_bsnow_obs_grid	FLOAT(:, :) -	1	The south polar low-rate blowing snow observation count two-dimensional gridded parameter. The number of low-rate profile blowing snow observations used in the computation of low-rate blowing snow frequency for the Antarctic. For each south polar grid cell this represents the number of valid blowing snow confidence 1 Hz (low-rate profile) observations (bsnow_con () .ne. INVALID), where the low-rate profile blowing snow confidence value exceeds the surface not detected value (bsnow_con () > -3, and is actually implemented as bsnow_con () => -2). Only valid detected blowing snow layer top height 1 Hz (low-rate profile) observations (bsnow_h () .ne. INVALID and bsnow_h () > 0.0) and only valid blowing snow confidence 1 Hz (low-rate profile) observations (bsnow_con () .ne. INVALID), where the low-rate blowing snow confidence value exceeds the

Name Standard Name	Type(Dims) FillValue	Units	Description
			surface not detected value (bsnow_con () > -3, and is implemented as bsnow_con () => -2) in each grid cell are used to compute the cell south polar low-rate blowing snow frequency (spolar_lorate_blowing_snow_freq (i,j)). Grid array organization: spolar_lorate_bsnow_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_lorate_bsnow_obs_grid (120,30), type: floating point. Reference: spolar_lorate_bsnow_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. The south polar observation counts are applicable to the atmosphere gridded parameter: spolar_lorate_blowing_snow_freq (i,j). Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_lowcloud_frac	FLOAT(:, :) INVALID_R4B	1	The south polar low (<= 4km) cloud fraction two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) that occurs below and up to and including 4 km from the layer top (layer_top(,) <= 4.0 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar low cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The ATL09 required number of layers (cloud_flag_atm ()), the layer attribute flag (layer_attr (,)), and the height of the detected layers (layer_top (,)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM

Name Standard Name	Type(Dims) FillValue	Units	Description
			high-rate profile processing. Grid array organization: <code>spolar_lowcloud_frac (i,j)</code>, where <code>i</code>=longitude index, <code>j</code>=latitude index, as per ATBD Section 2.0. Given the weekly <code>polar_grid_lon_scale = 3.0</code> degrees and the <code>polar_grid_lat_scale = 1.0</code> degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: <code>spolar_lowcloud_frac (120,30)</code>, type: floating point. Reference: <code>spolar_lowcloud_frac (1,1) = (-180.0</code> degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_lowcloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: <code>spolar_cloud_obs_grid (i,j)</code>. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
<code>spolar_midcloud_frac</code>	<code>FLOAT(:, :)</code> <code>INVALID_R4B</code>	1	The south polar middle (> 4km and <= 8km) cloud fraction two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (<code>layer_attr (,) = 1</code> within <code>cloud_flag_atm ()</code> layers) that occurs above 4 km and up to and including 8 km from the layer top (<code>layer_top (,) > 4.0</code> and <= 8.0 within <code>cloud_flag_atm ()</code> layers) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar middle cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (<code>=> obs_minimum</code>); otherwise set to <code>INVALID</code>. The ATL09 required number of layers (<code>cloud_flag_atm ()</code>), the layer attribute flag (<code>layer_attr (,)</code>), and the height of the detected layers (<code>layer_top (,)</code>) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array

Name Standard Name	Type(Dims) FillValue	Units	Description
			organization: spolar_midcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_midcloud_frac (120,30), type: floating point. Reference: spolar_midcloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_midcloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_opaquecloud_frac	FLOAT(:, :) INVALID_R4B	1	The south polar opaque cloud fraction two-dimensional atmospheric gridded parameter. For each south polar cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr () = 1 within cloud_flag_atm () layers) without surface signal detection (surface_sig () = 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar opaque cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The fraction of opaque clouds covering the entire grid cell. Opaque clouds are clouds that inhibit or absorb transmission of downward radiation through the cloud. The cloud layer with opaque characteristics exhibits no surface signal count return (=0.0), indicating that no transmitted photons reached the surface. The ATL09 required number of layers (cloud_flag_atm ()) and the layer attribute flag (layer_attr (,)) are determined

Name Standard Name	Type(Dims) FillValue	Units	Description
			from the backscatter profile using the DDA layer finder, and the required surface signal (surface_sig ()) is determined from the surface signal count of the number of photons in the detected surface bin, all in the L3A ATM high-rate profile processing. Grid array organization: spolar_opaquecloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_opaquecloud_frac (120,30), type: floating point. Reference: spolar_opaquecloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_opaquecloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.1.6.2] Transmissive and Opaque Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_surf_ddust_freq	FLOAT(:, :) INVALID_R4B	1	The south polar surface diamond dust frequency two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of the valid detected diamond dust density layer above the DEM surface height from all available 25 Hz (high-rate profile) observations to the number of all 25 Hz profile observation regardless of the values of the profile bottom height of the diamond dust density layer above the ellipsoid (ddust_hbot_dens()). This observation from the ALT09 is converted to a local bottom height of the diamond dust density layer above the surface (ddust_bot_ht), obtained by the subtraction of the profile digital elevation model (DEM) height (dem_h()). The valid set of ddust_bot_ht, along with other high-rate profile parameters: high-rate blowing

Name Standard Name	Type(Dims) FillValue	Units	Description
			snow height (hirate_bsnow_h()), the vertically aligned NRB bin number of the detected surface return (surface_bin()), and dem_h() are submitted in combination to establish the condition for the acceptable surface diamond dust density layer determination. The filtering test conditions are: 1) ddust_bot_ht<200.0, and 2) hirate_bsow_h()=INVALID or hirate_bsnow_h(>500.0, and 3) surface_bin(<700.0, and 4) dem_h(<500.0; all conditions being satisfied the south polar surface diamond dust density layer observation count numerator array cell (spol_surf_ddust_freq_sum(,)) is increment by one (1). The denominator array cells (spol_surf_ddust_freq_cnt(,)) are incremented for all 25 Hz observations. Grid array organization: spol_surf_ddust_freq (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spol_surf_ddust_freq (120,30), type: floating point. Reference: spol_surf_ddust_freq (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_surface_diamond_dust_freq_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spol_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.3.2] South Polar Surface Diamond Dust Frequency, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_surf_ddust_freq_obs_grid	FLOAT(:, :) -	1	The south polar surface diamond dust frequency observation count two-dimensional gridded parameter. The number of 25 Hz (high-rate) profile observations that reach the surface in the South polar / Antarctic region. The valid surface return profile observations are

Name Standard Name	Type(Dims) FillValue	Units	Description
			determined from the ATL09 parameter vertically aligned NRB bin number of the detected surface return, surface_bin (), when surface_bin () .ne. INVALID (surface_bin () = INVALID indicates that NO surface return was detected). Grid array organization: spolar_surf_ddust_freq_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_surf_ddust_freq_obs_grid (120,30), type: floating point. Reference: spolar_surf_ddust_freq_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. The south polar observation counts are applicable to the atmosphere gridded parameter: spolar_surf_ddust_freq (i,j). NOTE: while the south polar region latitude range is -90.0 to -60.0 degrees inclusive, the counting of the surface diamond dust density layer bottom heights are limited to the range of -90.0 to -65.0 degrees inclusive. Source: L3B ATM ATBD, [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_totalcloud_frac	FLOAT(:,:) INVALID_R4B	1	The south polar total cloud fraction two-dimensional atmospheric gridded parameter. For each south polar grid cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm () layers) to the number of all 25 Hz (high-rate profile) observations (spolar_cloud_obs_grid (i,j)) in the cell. The gridded south polar total cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (spolar_cloud_obs_grid (i,j) => obs_minimum); otherwise set to INVALID. The ATL09 required number of layers

Name Standard Name	Type(Dims) FillValue	Units	Description
			(cloud_flag_atm ()) and the layer attribute flag (layer_attr (.)) are determined from the backscatter profile using the DDA layer finder in the L3A ATM high-rate profile processing. Grid array organization: spolar_totalcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_totalcloud_frac (120,30), type: floating point. Reference: spolar_totalcloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_totalcloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum: 1.0. The parameter is now modified to include folded clouds in cloud layer counting (numerator grid cell array running summation). Either the first occurrence of a DDA detected cloud layer (layer_attr(.) = 1, or the first occurrence of DDA detected "folded down" cloud layer (layer_attr(.) = 11) within the number of cloud_flag_atm() layers, or the occurrence of folded clouds expected and/or detected from the 25 Hz (high-rate profile) observations (cloud_fold_flag() > 0 and cloud_fold_flag() < 127), where the following folded cloud flag values are accepted: 1=expected folded cloud from the GEOS5 FPIT 2D (ANC10) model data reported cloud top pressure translated to geometric altitude greater than 15 km, 2=calibrated attenuated backscatter profile from DDA indicates cloud signal from above 15 km folded down to the last 2-3 km of the range profile, 3=GEOS5-FPIT model reports cloud top geometric altitude > 15 km and backscatter profile indicates clouds above 15 km folded down to last 2-3 km in the range bins. Source: L3B ATM ATBD, [3.1.6.1] High, Middle, Low and Total Cloud Fraction, [5.0] Product Formats, Table 5. Gridded

Name Standard Name	Type(Dims) FillValue	Units	Description
			Products List of Gridded and Linear Parameters, Ancillary Data, and Images
spolar_transcloud_frac	FLOAT(:, :) INVALID_R4B	1	The south polar transmissive cloud fraction two-dimensional atmospheric gridded parameter. For each south polar cell this represents the ratio of the number of 25 Hz (high-rate profile) observations with at least one cloud layer (layer_attr (,) = 1 within cloud_flag_atm (,) layers) with surface signal detection (surface_sig (,) > 0.0) to the number of all 25 Hz (high-rate profile) observations in the cell. The gridded south polar transmissive cloud fraction values are produced when the number of all 25 Hz (high-rate profile) observations is equal to or greater than the minimum number of observations required for each grid cell (=> obs_minimum); otherwise set to INVALID. The fraction of transmissive clouds covering the entire grid cell. Transmissive clouds are clouds that permit or allow transmission of downward radiation through the cloud. The ATL09 required number of layers (cloud_flag_atm (,)) and the layer attribute flag (layer_attr (,)) are determined from the backscatter profile using the DDA layer finder, and the required detected surface signal (surface_sig (,)) is determined from the surface signal count of the number of photons in the detected surface bin, all in the L3A ATM high-rate profile processing. Grid array organization: spolar_transcloud_frac (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly polar_grid_lon_scale = 3.0 degrees and the polar_grid_lat_scale = 1.0 degrees, and the south polar latitude range is: -90.0 up to -60.0 degrees, the weekly gridded array dimension is: spolar_transcloud_frac (120,30), type: floating point. Reference: spolar_transcloud_frac (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the south polar projection array. Post-processing by the "atlas_plot" utility program using "plot_atl16.py" will generate and embed the image for this gridded parameter identified as "spolar_transcloud_frac_img" in the ATL16 product. The applicable south polar observation counts for this atmosphere gridded parameter are available from: spolar_cloud_obs_grid (i,j). Value range: minimum: 0.0, maximum:

Name Standard Name	Type(Dims) FillValue	Units	Description
			1.0. Source: L3B ATM ATBD, [3.1.6.2] Transmissive and Opaque Cloud Fraction, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images
tcod_obs_grid	FLOAT(:, :) -	1	The global total column optical depth observation count (formerly only over water, now over all surface types) two-dimensional gridded parameter. The number of observations used to compute the averaged global total column optical depth over all surfaces. Only valid surface return over all surfaces (column_od_asr_qf () .ne. 0 for no_signal) column optical depth (column_od_asr () .ne. INVALID and column_od_asr () > 0.0) 25 Hz (high-rate profile) observations in each grid cell are used to compute the cell average over-all-surfaces total column optical depth (global_column_od (i,j)). Grid array organization: tcod_obs_grid (i,j), where i=longitude index, j=latitude index, as per ATBD Section 2.0. Given the weekly global_grid_lon_scale = 3.0 degrees and the global_grid_lat_scale = 3.0 degrees, the weekly global gridded array dimension is: tcod_obs_grid (120,60), type: floating point. Reference: tcod_obs_grid (1,1) = (-180.0 degrees longitude, -90.0 degrees latitude), representing the lower left corner of the gridded parameter cell in the global projection array. The global observation counts are applicable to the atmosphere gridded parameter: global_column_od (i,j). Source: L3B ATM ATBD [3.8] Observation Grids, Table 4., Atmosphere Gridded Products Observation Grid Parameters, Sources, ApplicableParameters, [5.0] Product Formats, Table 5. Gridded Products List of Gridded and Linear Parameters, Ancillary Data, and Images

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.
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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. Type: double precision. Source: Operations
control	STRING(1) -	1	PGE-specific control file used to generate this granule. To re-use, replace breaks (BR) with linefeeds. Type: character string. Source: Operations
data_end_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the last data point within the granule. Type: character string. Source: Derived
data_start_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the first data point within the granule. Type: character string. 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. Type: integer. 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. Type: double precision. Source: Derived
end_geoseg	INTEGER(1) -	1	The ending geolocation segment number associated with the data contained within this granule. ICESat-2 granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created

Name Standard Name	Type(Dims) FillValue	Units	Description
			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. Type: integer. Source: Derived
end_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the last data point in the granule. Type: double precision. Source: Derived
end_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the last data point in the granule. Type: integer. 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. Type: integer. 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. Type: integer. Source: Derived
end_rgt	INTEGER(1) -	1	The ending reference ground track (RGT) number associated with the data contained within this granule. There are 1387 reference ground track in the ICESat-2 repeat orbit. The reference ground track increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft completes a full cycle. Type: integer. Source: Derived
granule_end_utc	STRING(1) -	1	Requested end time (in UTC CCSDS-A) of this granule. Type: character string. Source: Derived

Name Standard Name	Type(Dims) FillValue	Units	Description
granule_start_utc	STRING(1) -	1	Requested start time (in UTC CCSDS-A) of this granule. Type: character string. Source: Derived
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. Type: character string. 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. Type: integer. 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. Type: double precision. Source: Derived
start_geoseg	INTEGER(1) -	1	The starting geolocation segment number associated with the data contained within this granule. ICESat-2 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. Type: integer. Source: Derived
start_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the first data point in the granule. Type: double

Name Standard Name	Type(Dims) FillValue	Units	Description
			precision. Source: Derived
start_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the first data point in the granule. Type: integer. 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. Type: integer. 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. Type: integer. Source: Derived
start_rgt	INTEGER(1) -	1	The starting reference ground track (RGT) number associated with the data contained within this granule. There are 1387 reference ground track in the ICESat-2 repeat orbit. The reference ground track increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft completes a full cycle. Type: integer. 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. Type: character string. Source: Operations

1.3 Group: /ancillary_data/atmosphere

Contains general ancillary and processing control parameters.

1.3.1 Attributes

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

Name Standard Name	Type(Dims) FillValue	Units	Description
asr_cloud_threshold	INTEGER(1) -	1	The asr_cloud_threshold is a scalar control parameter. Indicating the minimum acceptable ASR cloud probability value (asr_cloud_probability) required to consider the cloud occurrence based on the apparent surface reflectivity magnitude from the ASR processing characteristics in the ATL09 data product. When the 25 Hz (high-rate data) profile asr_cloud_probability value is equal to or is greater than the asr_cloud_threshold the asr_cloud_probability is considered to be an indication of ASR detected cloud occurrence. The logic test is if [asr_cloud_probability => asr_cloud_threshold] then ASR cloud occurrence has been detected. The nominal [default] asr_cloud_threshold value is 70 for the ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: integer*4. Source: L3B ATM ATBD, [3.1.2] Combined Global Cloud Fraction, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
center_weight	FLOAT(1) -	1	The center_weight is a scalar control parameter. When the gridded image data parameters are smoothed, the center weight value is used to calculate the weight factor used to scale each cell in the smoothed image production. The nominal [default] center_weight value is 0.6. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [4.0] Smoothing of Images, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
data_type_flag	INTEGER_1(1) -	1	The data type flag is a scalar control parameter. The data_type_flag value =0 [default] indicates both night and day data were used to generate the product; the data_type_flag value =1 indicates night-only data were used to generate the product. A new option for day-only processing is added with the data_type_flag =2. Nighttime-only profile data is defined as solar_elevation () < 0.0. Daytime-only profile data is defined as solar_elevation () => 0.0. An execution override is provided within the production environment for replacement of the control parameter value. Type: integer*1. Source: L3B ATM ATBD, [1.1] Night-Only Versus Day-and-Night Profile Data Processing Control, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data Flags: 0()=process_both_day_and_night_profile_data_DEFAULT, 1()=process_night_only_profile_data, 2()=process_day_only_profile_data

Name Standard Name	Type(Dims) FillValue	Units	Description
filtered_obs_min	INTEGER(1) -	1	The filtered_obs_min is a scalar control parameter indicating the minimum acceptable filtered (i.e., a subset of all available) profile observation count value required to compute the specific atmosphere parameter grid cell value based on the observation count in the corresponding parameter denominator grid cell to be used in the rational calculation. The nominal [default] filtered_obs_min value is 10 for the weekly minimum denominator grid array observation cell count for the ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: integer = integer*4. Source: L3B ATM ATBD, [3.7] Minimum Number of Observations for Each Grid Box, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
gen_cloud_od_max	INTEGER(1) -	1	The gen_cloud_od_max is a scalar control parameter indicating the maximum acceptable estimated value for replacement of an INVALID ASR column optical depth value (column_od_asr()), when the flag column_od_asr_qf = 0 indicates no_signal for this profile observation). The profile parameter column_od_asr() and flag column_od_asr_qf() are required to supply the optical depth of the atmosphere column based on the apparent surface reflectance and the assumed actual surface reflectance supplied from the ASR processing characteristics in the ATL09 data product. The quality flag column_od_asr_qf.ne. 0 indicates that a valid column optical depth profile is produced over any surface type (land, sea_ice, land_ice, water). When the 25 Hz (high-rate data) profile column_od_asr() value is INVALID (i.e., column_od_asr_qf() = 0 for no_signal, meaning no ground return was detected due to opaque clouds), and the ATL09 profile surface type is for any or all-surfaces (surf_type(type,)=1, where type = land, ocean, sea ice, land ice, inland water), a randomly estimated over-all-surfaces cloud column optical depth value is calculated as a replacement value for the INVALID ASR profile observation. The control value gen_cloud_od_max is used directly in the computation of the estimated cloud column optical depth as a replacement of the INVALID profile column optical depth observation. The computation also employs a normal (Gaussian) probability distribution random number generator constrained to the range of calculated random number values from 0.0 to 1.0. The formula for the computation of the replacement cloud column optical depth value is represented in the following: $\text{est_cloud_col_od} = \text{normal_random}(0,1) * (\text{gen_cloud_od_max} - 3) + 3.$ The atmosphere gridded product expanded global total column optical depth over all surface types is considered as "expanded" due to added contribution of the est_cloud_col_od to the summation of the valid column_od_asr profile values. The nominal [default] gen_cloud_od_max value is 35 for the ATL16 product. Given the 0.0 to 1.0 range of generated normal distribution and the nominal value of 35.0, the expected range of the estimated cloud column optical depth is the range of 0.0 to 35.0 inclusive. An execution

Name Standard Name	Type(Dims) FillValue	Units	Description
			override is provided within the production environment for replacement of the control parameter value. Type: integer*4. NOTE: previously this was applied to over-water or ocean only surface types, but with this version is now applicable for all surface types. Source: L3B ATM ATBD, [3.2.2] Expanded Global Total Column Optical Depth, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
global_grid_lat_scale	FLOAT(1) -	degrees/cell	The global_grid_lat_scale is a scalar control parameter presenting the global grid cell latitude resolution (scale), in degrees per cell. The nominal [default] global_grid_lat_scale value is 3.0 degrees global latitude grid cell size for the weekly ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [1.0] Introduction, Table 2. Level-3B Atmosphere Gridded Products Parameters Grid Sizes and Dimensions, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
global_grid_lon_scale	FLOAT(1) -	degrees/cell	The global_grid_lon_scale is a scalar control parameter presenting the global grid cell longitude resolution (scale), in degrees per cell. The nominal [default] global_grid_lon_scale value is 3.0 degrees global longitude grid cell size for the weekly ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [1.0] Introduction, Table 2. Level-3B Atmosphere Gridded Products Parameters Grid Sizes and Dimensions, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
laser_angle_limit	FLOAT(:) -	degrees	The laser_angle_limit is a scalar control parameter used to set the acceptable off-nadir laser pointing angle limiting inclusion of 25 Hz (high-rate profile) column optical depth from apparent surface reflectance (ASR) (i.e., column_od_asr ()) from inclusion in the accumulation and counting in the computation of the weekly averaged global total column optical depth (i.e., global_column_od (,)) and averaged expanded global total column optical depth (i.e., expanded_global_column_od (,)) atmosphere gridded parameters. In similar manner, it is used to limit inclusion of the 25 Hz (high-rate profile) apparent surface reflectance (ASR) (i.e., apparent_surface_reflectance ()) from inclusion in the accumulation and counting in the computation of the monthly averaged global apparent surface reflectance (i.e., global_asr (,)), averaged north polar apparent surface reflectance (i.e., npolar_asr (,)), and averaged south polar apparent surface reflectance (i.e., spolar_asr (,)) atmosphere gridded parameters. The local off-nadir laser pointing angle (i.e., laser_angle ()) is determined from the 25 Hz (high-rate profile) beam elevation (i.e., beam_elevation ()), functionally originating with the ATL03 (i.e., ATLAS/ICESat-2 L2A Global Geolocated Photon Data Product) reference elevation.

Name Standard Name	Type(Dims) FillValue	Units	Description
			The profile beam_elevation (), along with the to-be-filtered column_od_asr () and apparent_surface_reflectance () profile parameters are all obtained from the ATL09 (i.e., ATLAS/ICESat-2 L3A Calibrated Backscatter Profiles and Atmospheric Layer Characteristics Product). The off-nadir angle laser angle is computed from the beam elevation using the following calculation formula: [laser_angle () = 90.0 - beam_elevation ()]. The logic test for constraining the column optical depth from ASR and ASR profile values to acceptable values is: [laser_angle () < laser_angle_limit]. The nominal [default] laser_angle_limit is 6.0 degrees for the ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [3.2.1.3] Application of Profile Laser Off-Nadir Angle Limitation Filtering for Global Total Column Optical Depth, [3.2.2.3] Application of Profile Laser Off-Nadir Angle Limitation Filtering for Expanded Global Total Column Optical Depth, and [3.4.1] Application of Profile Laser Off-Nadir Angle Limitation Filtering for Expanded Global and Polar Apparent Surface Reflectivity, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
no_filter_obs_min	INTEGER(1) -	1	The no_filter_obs_min is a scalar control parameter indicating the minimum acceptable unfiltered (i.e., all available) profile observation count value required to compute the specific atmosphere parameter grid cell value based on the observation count in the corresponding parameter denominator grid cell to be used in the rational calculation. The nominal [default] no_filter_obs_min value is 100 for the weekly minimum denominator grid array observation cell count for the ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: integer = integer*4. Source: L3B ATM ATBD, [3.7] Minimum Number of Observations for Each Grid Box, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
polar_grid_lat_scale	FLOAT(1) -	degrees/cel 	The polar_grid_lat_scale is a scalar control parameter presenting the north or south polar grid latitude resolution (scale), in degrees per cell. The nominal [default] polar_grid_lat_scale value is 1.0 degrees polar latitude grid cell size for the weekly ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [1.0] Introduction, Table 2. Level-3B Atmosphere Gridded Products Parameters Grid Sizes and Dimensions, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
polar_grid_lon_scale	FLOAT(1) -	degrees/cel 	The polar_grid_lon_scale is a scalar control parameter presenting the north or south polar longitude grid resolution (scale), in degrees per cell. The nominal [default] polar_grid_lon_scale value is 3.0 degrees polar

Name Standard Name	Type(Dims) FillValue	Units	Description
			longitude grid cell size for the weekly ATL16 product. An execution override is provided within the production environment for replacement of the control parameter value. Type: floating point. Source: L3B ATM ATBD, [1.0] Introduction, Table 2. Level-3B Atmosphere Gridded Products Parameters Grid Sizes and Dimensions, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data
smooth_grid	INTEGER_1(1) -	1	The smooth_grid is a scalar control parameter for the application of the Section 4.0 smoothing algorithm to the product global, north polar, and south polar Images. The nominal [default] smooth_grid value set to 1 indicates to apply the smoothing algorithm to the data used to generate the images; the smooth_grid value set to 0 indicates do not apply the smoothing algorithm to the data used to generate the images. When image gridded data smoothing is selected the smoothing algorithm is applied to intermediate working data arrays for each parameter, and is NOT applied to the actual product gridded parameter arrays content (i.e., the gridded data parameters remain un-smoothed). An execution override is provided within the production environment for replacement of the control parameter value. Type: integer*1. Source: L3B ATM ATBD, [4.0] Smoothing of Images, [5.0] Product Formats, Table 6. Gridded Products List of Ancillary Control Data Flags: 1(=)apply_smoothing_to_image_data_DEFAULT, 0(=)do_not_apply_smoothing_to_image_data

1.4 Group: /orbit_info

Contains orbit information.

1.4.1 Attributes

data_rate	Varies. Data are only provided when one of the stored values (besides time) changes.
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1.4.2 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

Name Standard Name	Type(Dims) FillValue	Units	Description
			offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Type: double precision. Source: POD/PPD
cycle_number	INTEGER_1(:) -	1	A count of the number of exact repeats of this reference orbit. Type: integer*1. Source: Operations
lan	DOUBLE(:) -	degrees_east	Longitude at the ascending node crossing. Type: double precision. 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. Type: integer*2. 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. Type: integer*1. 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 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

Name Standard Name	Type(Dims) FillValue	Units	Description
			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. Type: double precision. Source: POD/PPD

1.5 Group: /quality_assessment

Contains quality assessment data. This may include QA counters, QA along-track data and/or QA summary data. Also contains atmosphere gridded parameter statistical data.

1.5.1 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

1.6 Group: /quality_assessment/atmosphere

Contains statistical parameters (including minimum, maximum, mean, and standard deviation) for each atmosphere gridded parameter.

1.6.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
combined_global_cloud_frac_max	FLOAT(1) -	fraction	The combined global cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product

Name Standard Name	Type(Dims) FillValue	Units	Description
			Formats, Table 7. Gridded Products List of Statistical Parameters
combined_global_cloud_frac_mean	FLOAT(1) -	fraction	The combined global cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
combined_global_cloud_frac_min	FLOAT(1) -	fraction	The combined global cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
combined_global_cloud_frac_sdev	FLOAT(1) -	fraction	The combined global cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
expanded_global_column_od_max	FLOAT(1) -	1	The expanded global total column optical depth gridded array maximum value for all VALID profile and estimated value averaged cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 35.0. Maximum value is not expected to exceed 35.0. NOTE: this parameter was previously averaged for only over water or ocean surface types, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
expanded_global_column_od_mean	FLOAT(1) -	1	The expanded global total column optical depth gridded array mean value for all VALID profile and estimated value averaged cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 35.0. Maximum value is not expected to exceed 35.0. NOTE:

Name Standard Name	Type(Dims) FillValue	Units	Description
			this parameter was previously averaged for only over water or ocean surface types, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
expanded_global_column_od_min	FLOAT(1) -	1	The expanded global total column optical depth gridded array minimum value for all VALID profile and estimated value averaged cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 35.0. Maximum value is not expected to exceed 35.0. NOTE: this parameter was previously averaged for only over water or ocean surface types, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
expanded_global_column_od_sdev	FLOAT(1) -	1	The expanded global total column optical depth gridded array standard deviation value for all VALID profile and estimated value averaged cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 35.0. Maximum value is not expected to exceed 35.0. NOTE: this parameter was previously averaged for only over water or ocean surface types, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_aerosol_frac_max	FLOAT(1) -	fraction	The global aerosol fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_aerosol_frac_mean	FLOAT(1) -	fraction	The global aerosol fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_aerosol_frac_min	FLOAT(1) -	fraction	The global aerosol fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_aerosol_frac_sdev	FLOAT(1) -	fraction	The global aerosol fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_cloud_frac_max	FLOAT(1) -	fraction	The weekly global ASR cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_cloud_frac_mean	FLOAT(1) -	fraction	The weekly global ASR cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_cloud_frac_min	FLOAT(1) -	fraction	The weekly global ASR cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_cloud_frac_sdev	FLOAT(1) -	fraction	The weekly global ASR cloud fraction gridded array standard deviation value

Name Standard Name	Type(Dims) FillValue	Units	Description
			for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_max	FLOAT(1) -	1	The global apparent surface reflectance gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_mean	FLOAT(1) -	1	The global apparent surface reflectance gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_min	FLOAT(1) -	1	The global apparent surface reflectance gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_asr_sdev	FLOAT(1) -	1	The global apparent surface reflectance gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
global_clear_frac_max	FLOAT(1) -	fraction	The global clear fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_clear_frac_mean	FLOAT(1) -	fraction	The global clear fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_clear_frac_min	FLOAT(1) -	fraction	The global clear fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_clear_frac_sdev	FLOAT(1) -	fraction	The global clear fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_cloud_frac_max	FLOAT(1) -	fraction	The global cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_cloud_frac_mean	FLOAT(1) -	fraction	The global cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product

Name Standard Name	Type(Dims) FillValue	Units	Description
			Formats, Table 7. Gridded Products List of Statistical Parameters
global_cloud_frac_min	FLOAT(1) -	fraction	The global cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_cloud_frac_sdev	FLOAT(1) -	fraction	The global cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_column_od_max	FLOAT(1) -	1	The global total column optical depth gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 4.0. Maximum value is not expected to exceed 4.0. NOTE: this parameter was previously averaged for only over water surface type, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_column_od_mean	FLOAT(1) -	1	The global total column optical depth gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 4.0. Maximum value is not expected to exceed 4.0. NOTE: this parameter was previously averaged for only over water surface type, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_column_od_min	FLOAT(1) -	1	The global total column optical depth gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0,

Name Standard Name	Type(Dims) FillValue	Units	Description
			maximum: 4.0. Maximum value is not expected to exceed 4.0. NOTE: this parameter was previously averaged for only over water surface type, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_column_od_sdev	FLOAT(1) -	1	The global total column optical depth gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 4.0. Maximum value is not expected to exceed 4.0. NOTE: this parameter was previously averaged for only over water surface type, however, is now calculated over all surface types. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_folded_cloud_freq_max	FLOAT(1) -	percent	The global folded cloud frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.1.7] Global Folded Cloud Frequency, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_folded_cloud_freq_mean	FLOAT(1) -	percent	The global folded cloud frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.1.7] Global Folded Cloud Frequency, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_folded_cloud_freq_min	FLOAT(1) -	percent	The global folded cloud frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.1.7] Global Folded Cloud Frequency, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_folded_cloud_freq_sdev	FLOAT(1) -	percent	The global folded cloud frequency gridded array standard deviation value for all VALID cells as a scalar statistical

Name Standard Name	Type(Dims) FillValue	Units	Description
			parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.1.7] Global Folded Cloud Frequency, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_grnd_detect_max	FLOAT(1) -	fraction	The global ground detection frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_grnd_detect_mean	FLOAT(1) -	fraction	The global ground detection frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_grnd_detect_min	FLOAT(1) -	fraction	The global ground detection frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
global_grnd_detect_sdev	FLOAT(1) -	fraction	The global ground detection frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_cloud_frac_max	FLOAT(1) -	fraction	The weekly north polar ASR cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
npolar_asr_cloud_frac_mean	FLOAT(1) -	fraction	The weekly north polar ASR cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_cloud_frac_min	FLOAT(1) -	fraction	The weekly north polar ASR cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_cloud_frac_sdev	FLOAT(1) -	fraction	The weekly north polar ASR cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_max	FLOAT(1) -	1	The north polar apparent surface reflectance gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_mean	FLOAT(1) -	1	The north polar apparent surface reflectance gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
npolar_asr_min	FLOAT(1) -	1	The north polar apparent surface reflectance gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_asr_sdev	FLOAT(1) -	1	The north polar apparent surface reflectance gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_grnd_detect_max	FLOAT(1) -	fraction	The north polar ground detection frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_grnd_detect_mean	FLOAT(1) -	fraction	The north polar ground detection frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_grnd_detect_min	FLOAT(1) -	fraction	The north polar ground detection frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
npolar_grnd_detect_sdev	FLOAT(1) -	fraction	The north polar ground detection frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_highcloud_frac_max	FLOAT(1) -	fraction	The north polar high (> 8km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_highcloud_frac_mean	FLOAT(1) -	fraction	The north polar high (> 8km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_highcloud_frac_min	FLOAT(1) -	fraction	The north polar high (> 8km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_highcloud_frac_sdev	FLOAT(1) -	fraction	The north polar high (> 8km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_hirate_blowing_snow_freq_max	FLOAT(1) -	percent	The north polar high-rate blowing snow frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0,

Name Standard Name	Type(Dims) FillValue	Units	Description
			maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_hirate_blowing_snow_freq_mean	FLOAT(1) -	percent	The north polar high-rate blowing snow frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_hirate_blowing_snow_freq_min	FLOAT(1) -	percent	The north polar high-rate blowing snow frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_hirate_blowing_snow_freq_sdev	FLOAT(1) -	percent	The north polar high-rate blowing snow frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lorate_blowing_snow_freq_max	FLOAT(1) -	percent	The north polar low-rate blowing snow frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lorate_blowing_snow_freq_mean	FLOAT(1) -	percent	The north polar low-rate blowing snow frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
npolar_lorate_blowing_snow_freq_min	FLOAT(1) -	percent	The north polar low-rate blowing snow frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lorate_blowing_snow_freq_sdev	FLOAT(1) -	percent	The north polar low-rate blowing snow frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lowcloud_frac_max	FLOAT(1) -	fraction	The north polar low (<= 4km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lowcloud_frac_mean	FLOAT(1) -	fraction	The north polar low (<= 4km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lowcloud_frac_min	FLOAT(1) -	fraction	The north polar low (<= 4km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_lowcloud_frac_sdev	FLOAT(1) -	fraction	The north polar low (<= 4km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_midcloud_frac_max	FLOAT(1) -	fraction	The north polar middle (> 4km and <= 8km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, Section 3.9, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_midcloud_frac_mean	FLOAT(1) -	fraction	The north polar middle (> 4km and <= 8km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_midcloud_frac_min	FLOAT(1) -	fraction	The north polar middle (> 4km and <= 8km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_midcloud_frac_sdev	FLOAT(1) -	fraction	The north polar middle (> 4km and <= 8km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_opaquecloud_frac_max	FLOAT(1) -	fraction	The north polar opaque cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product

Name Standard Name	Type(Dims) FillValue	Units	Description
			Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_opaquecloud_frac_mean	FLOAT(1) -	fraction	The north polar opaque cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_opaquecloud_frac_min	FLOAT(1) -	fraction	The north polar opaque cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_opaquecloud_frac_sdev	FLOAT(1) -	fraction	The north polar opaque cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_totalcloud_frac_max	FLOAT(1) -	fraction	The north polar total cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_totalcloud_frac_mean	FLOAT(1) -	fraction	The north polar total cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_totalcloud_frac_min	FLOAT(1) -	fraction	The north polar total cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value

Name Standard Name	Type(Dims) FillValue	Units	Description
			range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_totalcloud_frac_sdev	FLOAT(1) -	fraction	The north polar total cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_transcloud_frac_max	FLOAT(1) -	fraction	The north polar transmissive cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_transcloud_frac_mean	FLOAT(1) -	fraction	The north polar transmissive cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_transcloud_frac_min	FLOAT(1) -	fraction	The north polar transmissive cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
npolar_transcloud_frac_sdev	FLOAT(1) -	fraction	The north polar transmissive cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
spolar_asr_cloud_frac_max	FLOAT(1) -	fraction	The weekly south polar ASR cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_cloud_frac_mean	FLOAT(1) -	fraction	The weekly south polar ASR cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_cloud_frac_min	FLOAT(1) -	fraction	The weekly south polar ASR cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_cloud_frac_sdev	FLOAT(1) -	fraction	The weekly south polar ASR cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_max	FLOAT(1) -	1	The south polar apparent surface reflectance gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_mean	FLOAT(1) -	1	The south polar apparent surface reflectance gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point.

Name Standard Name	Type(Dims) FillValue	Units	Description
			Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_min	FLOAT(1) -	1	The south polar apparent surface reflectance gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_asr_sdev	FLOAT(1) -	1	The south polar apparent surface reflectance gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Expected value range: minimum: 0.0, maximum: 1.0. Maximum value may exceed 1.0 (e.g., 1.08103633). Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_grnd_detect_max	FLOAT(1) -	fraction	The south polar ground detection frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_grnd_detect_mean	FLOAT(1) -	fraction	The south polar ground detection frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_grnd_detect_min	FLOAT(1) -	fraction	The south polar ground detection frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value

Name Standard Name	Type(Dims) FillValue	Units	Description
			range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_grnd_detect_sdev	FLOAT(1) -	fraction	The south polar ground detection frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_highcloud_frac_max	FLOAT(1) -	fraction	The south polar high (> 8km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_highcloud_frac_mean	FLOAT(1) -	fraction	The south polar high (> 8km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_highcloud_frac_min	FLOAT(1) -	fraction	The south polar high (> 8km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_highcloud_frac_sdev	FLOAT(1) -	fraction	The south polar high (> 8km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
spolar_hirate_blowing_snow_freq_max	FLOAT(1) -	percent	The south polar high-rate blowing snow frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_hirate_blowing_snow_freq_mean	FLOAT(1) -	percent	The south polar high-rate blowing snow frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_hirate_blowing_snow_freq_min	FLOAT(1) -	percent	The south polar high-rate blowing snow frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_hirate_blowing_snow_freq_sdev	FLOAT(1) -	percent	The south polar high-rate blowing snow frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lorate_blowing_snow_freq_max	FLOAT(1) -	percent	The south polar low-rate blowing snow frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lorate_blowing_snow_freq_mean	FLOAT(1) -	percent	The south polar low-rate blowing snow frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value

Name Standard Name	Type(Dims) FillValue	Units	Description
			range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lorate_blowing_snow_freq_min	FLOAT(1) -	percent	The south polar low-rate blowing snow frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lorate_blowing_snow_freq_sdev	FLOAT(1) -	percent	The south polar low-rate blowing snow frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 100.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lowcloud_frac_max	FLOAT(1) -	fraction	The south polar low (<= 4km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lowcloud_frac_mean	FLOAT(1) -	fraction	The south polar low (<= 4km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_lowcloud_frac_min	FLOAT(1) -	fraction	The south polar low (<= 4km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
spolar_lowcloud_frac_sdev	FLOAT(1) -	fraction	The south polar low (≤ 4 km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_midcloud_frac_max	FLOAT(1) -	fraction	The south polar middle (> 4 km and ≤ 8 km) cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_midcloud_frac_mean	FLOAT(1) -	fraction	The south polar middle (> 4 km and ≤ 8 km) cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_midcloud_frac_min	FLOAT(1) -	fraction	The south polar middle (> 4 km and ≤ 8 km) cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_midcloud_frac_sdev	FLOAT(1) -	fraction	The south polar middle (> 4 km and ≤ 8 km) cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters

Name Standard Name	Type(Dims) FillValue	Units	Description
spolar_opaquecloud_frac_max	FLOAT(1) -	fraction	The south polar opaque cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_opaquecloud_frac_mean	FLOAT(1) -	fraction	The south polar opaque cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_opaquecloud_frac_min	FLOAT(1) -	fraction	The south polar opaque cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_opaquecloud_frac_sdev	FLOAT(1) -	fraction	The south polar opaque cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_surf_ddust_freq_max	FLOAT(1) -	1	The south polar surface diamond dust frequency gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_surf_ddust_freq_mean	FLOAT(1) -	1	The south polar surface diamond dust frequency gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product

Name Standard Name	Type(Dims) FillValue	Units	Description
			Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_surf_ddust_freq_min	FLOAT(1) -	1	The south polar surface diamond dust frequency gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_surf_ddust_freq_sdev	FLOAT(1) -	1	The south polar surface diamond dust frequency gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_totalcloud_frac_max	FLOAT(1) -	fraction	The south polar total cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_totalcloud_frac_mean	FLOAT(1) -	fraction	The south polar total cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_totalcloud_frac_min	FLOAT(1) -	fraction	The south polar total cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_totalcloud_frac_sdev	FLOAT(1) -	fraction	The south polar total cloud fraction gridded array standard deviation value

Name Standard Name	Type(Dims) FillValue	Units	Description
			for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_transcloud_frac_max	FLOAT(1) -	fraction	The south polar transmissive cloud fraction gridded array maximum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_transcloud_frac_mean	FLOAT(1) -	fraction	The south polar transmissive cloud fraction gridded array mean value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_transcloud_frac_min	FLOAT(1) -	fraction	The south polar transmissive cloud fraction gridded array minimum value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters
spolar_transcloud_frac_sdev	FLOAT(1) -	fraction	The south polar transmissive cloud fraction gridded array standard deviation value for all VALID cells as a scalar statistical parameter. Type: floating point. Value range: minimum: 0.0, maximum: 1.0. Source: L3B ATM ATBD, [3.9] Product Statistical Values, [5.0] Product Formats, Table 7. Gridded Products List of Statistical Parameters