

GLAH11 Product Data Dictionary

File-Level (Global) Attributes

| Attribute | Example Value |
|---------------------------------------|--|
| featureType | timeSeries |
| ShortName | GLAH11 |
| title | GLAS/ICESat L2 Global Thin Cloud/Aerosol Optical Depths Data (HDF5) |
| comment | The level 2 thin cloud/aerosol data contains optical depths for clouds for up to 10 layers, the planetary boundary layer, and aerosols for up to 8 layers. Data granules will contain approximately 23 hours (14 orbits) of data. |
| summary | The purpose of GLAH11 is to provide the thin cloud/aerosol optical depth data to researchers. Cloud data are provided at 1Hz and aerosol data are provided at .25Hz. Each GLAH11 file was created from an equivalent GLA11 binary file. The data used to create the GLAH11 values are contained in the equivalent GLAHxx files for the GLAxx files. See the provenance metadata for the creation of the GLA11. |
| license | http://nsidc.org/data/icesat/disclaimer.html |
| references | https://nsidc.org/data/glah02-glah07-glah08-glah09-glah10-glah11/versions/33/documentation (Guide Document for this product at NSIDC), http://nsidc.org/data/icesat/ (GLAS Product page at NSIDC) |
| AccessConstraints | Data may not be reproduced or distributed without including the CitationForExternalPublication for this product included in this Metadata. Data may not be distributed in an altered form without the written permission of the GLAS Science Team. |
| CitationforExternalPublication | The data used in this study were produced by the GLAS Science Team at the ICESat Science Investigator-led Processing System (I-SIPS) at NASA/GSFC. The data archive site is the NSIDC DAAC. |
| contributor_role | Data Originator, Investigator, Producer, Producer |
| contributor_name | David W. Hancock (David.W.Hancock@nasa.gov), Bob E Schutz (schutz@utcsr.ae.utexas.edu), Jay Zwally (Jay.Zwally@nasa.gov), John P DiMarzio (John.P.Dimarzio.1@nasa.gov) |
| creator_name | ICESat Science Investigator-led Processing System (I-SIPS) |
| creator_email | David.W.Hancock@nasa.gov |
| publisher_name | NSIDC User Services |
| publisher_email | nsidc@nsidc.org |
| publisher_url | http://nsidc.org/data/icesat/ |
| platform | Ice, Cloud, and Land Elevation Satellite (ICESat) |
| instrument | Geoscience Laser Altimeter System (GLAS) |
| processing_level | 2 |

| Attribute | Example Value |
|--|--|
| date_created | 2013-02-08T12:02:51 |
| spatial_coverage_type | Horizontal |
| history | 2011-06-20T15:27:20 glas_atm 6.0.1 GLA11_633_2103_002_0407_0_01_0001.DAT, 2013-02-08T12:02:51.000000Z GLA11_h5_convert Version 1.1 (February 2013) out/GLAH11_633_2103_002_0407_0_01_0001.H5 |
| geospatial_lat_min | -90.0 |
| geospatial_lat_max | 90.0 |
| geospatial_lon_min | -180.0 |
| geospatial_lon_max | 180.0 |
| geospatial_lat_units | degrees_north |
| geospatial_lon_units | degrees_east |
| keywords | Earth Science > Atmosphere > Clouds > Cloud Optical Depth/Thickness, Earth Science > Atmosphere > Aerosols > Aerosol Optical Depth/Thickness |
| keywords_vocabulary | GCMD Science Keywords Version 6.0 |
| standard_vocabulary_name | CF-1.6 |
| naming_authority | http://dx.doi.org/10.5067/ICESAT/GLAS/DATA204 |
| project | Ice, Cloud, and Land Elevation Satellite (GLAS_HDF) |
| time_type | UTC |
| date_type | J2000 |
| time_coverage_start | 2003-11-18T01:51:38 |
| time_coverage_end | 2003-11-19T00:24:45 |
| time_coverage_duration | 81280 |
| source | Satellite Measurements |
| HDFVersion | HDF5 1.8.9 |
| identifier_file_uuid | 599740C3-F062-4F49-A756-8A0DA37BC95B |
| identifier_product_doi | 10.5067/ICESAT/GLAS/DATA204 |
| identifier_product_type | GLAH11 |
| identifier_product_format_version | 1.0 |
| Conventions | CF-1.6 |
| institution | National Aeronautics and Space Administration (NASA) |

Group: /Data_4s

This group contains data with a rate of once per 4 seconds. 4 second data may be indexed to the 1HZ data using the `i_rec_ndx` parameter in each respective time group.

Dimension Scales

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-------------------------|-----------------------|--|---------|--|-------------------------|-------------|
| DS_UTCTime_4s | DOUBLE (UNLIMITED) | Transmit Time of First Shot in frame in J2000 (time) | seconds | The transmit time of the first shot in the 4 second frame measured as 'UTC seconds' elapsed since Jan 1 2000 12:00:00 UTC. This time has been derived from the GPS time accounting for leap seconds. | Rel 33 GLAS Binary Data | NOT_SET |
| DS_Cloud_Layer_2 | INTEGER (UNLIMITED) | Cloud Layer Index (NOT_SET) | NOT_SET | This array contains the cloud layer index, up to 2 | Constants | NOT_SET |
| DS_Cloud_Layer_8 | INTEGER (UNLIMITED) | Cloud Layer Index (NOT_SET) | NOT_SET | This array contains the cloud layer index, up to 8 | Constants | NOT_SET |
| DS_Cloud_Layer_9 | INTEGER (UNLIMITED) | Cloud Layer Index (NOT_SET) | NOT_SET | This array contains the cloud layer index, up to 9 | Constants | NOT_SET |

Group: Data_4s/Time

This group contains the 4s index and time-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates | | | | |
|----------------------|----------------------------------|--------------------------------|---------|--|-------------------------|---------------|------|----------------------------------|-------------------------|----|
| i_rec_ndx | INTEGER (UNLIMITED) | GLAS Record Index (NOT_SET) | NOT_SET | Unique index that relates this record to the corresponding record(s) in each GLAS data product. | Rel 33 GLAS Binary Data | D: | | | | |
| shot_time_flg | INTEGER_1 (UNLIMITED) | time correction flag (NOT_SET) | NOT_SET | Shot time;0=shot time is transmit time;1=shot time is ground bounce time <table border="1" data-bbox="782 1478 1390 1612"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>transmit_time ground_bounce_time</td> </tr> </table> | flag values | flag_meanings | 0, 1 | transmit_time ground_bounce_time | Rel 33 GLAS Binary Data | D: |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | transmit_time ground_bounce_time | | | | | | | | | |
| gps_time_flg | INTEGER_1 (UNLIMITED) | time correction flag (NOT_SET) | NOT_SET | GPS time;0=no delta gps time correction applied to shot time;1=delta gps time correction applied to shot time <table border="1" data-bbox="782 1734 1390 1869"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>not_applied applied</td> </tr> </table> | flag values | flag_meanings | 0, 1 | not_applied applied | Rel 33 GLAS Binary Data | D: |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | not_applied applied | | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | cc | | | | |
|----------------------|-----------------------|--------------------------------|---------|---|-------------|---------------|------|---------------------|-------------------------|----|
| pl_timing_flg | INTEGER_1 (UNLIMITED) | time correction flag (NOT_SET) | NOT_SET | Post-launch timing;0=no post-launch timing bias applied;1=post-launch timing bias applied - see header for value <table border="1" data-bbox="782 268 1388 403"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>not_applied applied</td> </tr> </table> | flag values | flag_meanings | 0, 1 | not_applied applied | Rel 33 GLAS Binary Data | D: |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | not_applied applied | | | | | | | | | |
| ddelay_flg | INTEGER_1 (UNLIMITED) | time correction flag (NOT_SET) | NOT_SET | Digitizer turn-on delay;0=digitizer turn-on delay accounted for in shot time - see header;1=digitizer turn-on delay not accounted for in shot time <table border="1" data-bbox="782 554 1388 688"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>applied not_applied</td> </tr> </table> | flag values | flag_meanings | 0, 1 | applied not_applied | Rel 33 GLAS Binary Data | D: |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | applied not_applied | | | | | | | | | |
| peaktp_flg | INTEGER_1 (UNLIMITED) | time correction flag (NOT_SET) | NOT_SET | Peak of transmit pulse;0=time to peak of transmit pulse accounted for in shot time;1=time to peak of transmit pulse not accounted for in shot time <table border="1" data-bbox="782 837 1388 972"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>applied not_applied</td> </tr> </table> | flag values | flag_meanings | 0, 1 | applied not_applied | Rel 33 GLAS Binary Data | D: |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | applied not_applied | | | | | | | | | |

Group: Data_4s/Geolocation

This group contains geolocation-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|--------------|-----------------------|---|---------------|--|-------------------------|---------------|
| d_lat | DOUBLE (UNLIMITED) | Profile Location, Latitude (latitude) | degrees_north | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 0.25 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| d_lon | DOUBLE (UNLIMITED) | Profile Location, Longitude (longitude) | degrees_east | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 0.25 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_4s |

Group: Data_4s/Flags

This group contains flags at 1 per 4 sec.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates | | | | |
|------------------|-----------------------|---------------------------|---------|---|-------------|---------------|------|-----------------------|-------------------------|-----------|
| i_AttFlg3 | INTEGER_1 (UNLIMITED) | Attitude Flag 3 (NOT_SET) | NOT_SET | Attitude Flag 3, 0=PAD used for geolocation, 1=PAD not used for geolocation. <table border="1" data-bbox="734 1827 1295 1961"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>PAD_used PAD_not_used</td> </tr> </table> | flag values | flag_meanings | 0, 1 | PAD_used PAD_not_used | Rel 33 GLAS Binary Data | DS_UTCTim |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | PAD_used PAD_not_used | | | | | | | | | |

Group: Data_4s/PBL4_od

This group contains the 4 second PBL Optical Depth related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-----------------------------|-----------------------|--|----------------|--|-------------------------|---------------|
| r_aer4_ht | REAL (UNLIMITED) | Low Resolution PBL Height at 532 nm (Planetary Boundary Layer) | meters | Low resolution Planetary Boundary Layer height at 0.25hz, 1 per profile | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_PBL_LR_grd_det | REAL (UNLIMITED) | Low Resolution Ground Detection at 532 nm (NOT_SET) | meters | Low resolution processed ground detection height at 0.25hz, 1 per profile | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_pbl4_od | REAL (UNLIMITED) | PBL Optical Depth at 532 nm (NOT_SET) | NOT_SET | 532 nm Planetary Boundary Layer aerosol optical depth, corrected for multiple scattering at 0.25hz, 1 per layer, 1 layer | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_PBL_LR_pres | REAL (UNLIMITED) | Pressure of Low Resolution Planetary Boundary Layer Top at 532 nm (NOT_SET) | hPa | Pressure of Low Resolution Planetary Boundary Layer Top at 532 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_PBL_LR_relh | REAL (UNLIMITED) | Relative Humidity of Low Resolution Planetary Boundary Layer Top at 532 nm (NOT_SET) | percent | Relative Humidity of Low Resolution Planetary Boundary Layer Top at 532 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_PBL_LR_temp | REAL (UNLIMITED) | Temperature of Low Resolution Planetary Boundary Layer Top at 532 nm (NOT_SET) | degree Celsius | Temperature of Low Resolution Planetary Boundary Layer Top at 532 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |

Group: Data_4s/LowResAerosol_OD

This group contains the low Resolution Aerosol Optical Depth 1064 parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source |
|-------------------|-----------------------|---|---------|---|-------------------------|
| r_aer4_bot | REAL (UNLIMITED, 8) | Low Resolution Aerosol Layer Bottom at 532 nm (NOT_SET) | meters | Low resolution aerosol layer bottom heights for layers which were selected for optical processing at 0.25hz, 1 per layer, 9 layers including the planetary boundary layer and PSC | Rel 33 GLAS Binary Data |
| r_aer4_top | REAL (UNLIMITED, 8) | Low Resolution Aerosol Layer Top at 532 nm (NOT_SET) | meters | Low resolution aerosol layer top heights for layers which were selected for optical processing at 0.25hz, 1 per layer, 9 layers including the planetary boundary layer and PSC | Rel 33 GLAS Binary Data |
| r_aer4_od | REAL (UNLIMITED, 8) | Aerosol Optical Depth at 532 nm (NOT_SET) | NOT_SET | 532 nm elevated aerosol optical depth, corrected for multiple scattering, at 0.25hz, 1 per layer, 8 layers | Rel 33 GLAS Binary Data |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source |
|--------------------------|-----------------------|---|----------------|--|-------------------------|
| r_aer4_aod_ratio | REAL (UNLIMITED, 9) | 532/1064 aerosol optical depth ratio (NOT_SET) | NOT_SET | The ratio of 532 nm aerosol optical depth to 1064 nm aerosol optical depth for each detected aerosol layer. | Rel 3: GLAS Binary Data |
| r_aer4_msf | REAL (UNLIMITED, 9) | Aerosol Multiple Scattering Factor (NOT_SET) | NOT_SET | Aerosol multiple scattering coefficient used at 0.25hz, up to 9 layers (including PSC and PBL) | Rel 3: GLAS Binary Data |
| r_aer4_sval_ratio | REAL (UNLIMITED, 9) | 532/1064 aerosol S ratio (NOT_SET) | NOT_SET | The ratio of 532 nm extinction to backscatter ratio (S532) to the 1064 nm extinction to backscatter ratio (S1064) for each detected aerosol layer. | Rel 3: GLAS Binary Data |
| r_aer4_sval1 | REAL (UNLIMITED, 9) | Aerosol true S Values from table (NOT_SET) | sr | Aerosol true extinction to backscatter ratios calculated from meteorological and geographic data | Rel 3: GLAS Binary Data |
| r_Aer_bot_pres | REAL (UNLIMITED, 9) | Aerosol Layers Pressure at Bottom of Layer at 532 nm (NOT_SET) | hPa | Aerosol Layers Pressure at Bottom of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_Aer_bot_relh | REAL (UNLIMITED, 9) | Aerosol Layers Relative Humidity at Bottom of Layer at 532 nm (NOT_SET) | percent | Aerosol Layers Relative Humidity at Bottom of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_Aer_bot_temp | REAL (UNLIMITED, 9) | Aerosol Layers Temperature at Bottom of Layer at 532 nm (NOT_SET) | degree Celsius | Aerosol Layers Temperature at Bottom of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_Aer_top_pres | REAL (UNLIMITED, 9) | Aerosol Layers Pressure at Top of Layer at 532 nm (NOT_SET) | hPa | Aerosol Layers Pressure at Top of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_Aer_top_relh | REAL (UNLIMITED, 9) | Aerosol Layers Relative Humidity at Top of Layer at 532 nm (NOT_SET) | percent | Aerosol Layers Relative Humidity at Top of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_Aer_top_temp | REAL (UNLIMITED, 9) | Aerosol Layers Temperature at Top of Layer at 532 nm (NOT_SET) | degree Celsius | Aerosol Layers Temperature at Top of Layer at 532 nm | Rel 3: GLAS Binary Data |
| r_aod_4s | REAL (UNLIMITED) | Total Column Aerosol OD (AOD) (NOT_SET) | NOT_SET | Total column aerosol optical depth (AOD). | Rel 3: GLAS Binary Data |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | sourc | | | | |
|---|--|---|---------|--|-------------|---------------|---|--|----------------------------------|
| i_aod_flg_4s | INTEGER_1 (UNLIMITED) | AOD use flag (NOT_SET) | NOT_SET | <p>AOD use flag. The total column AOD use flag ranges from 0 - 7 and has the following meanings: 0 - night, full column good, no bad layers, ground detected - highest quality; 1 - day, no full column, sum of all detected layers, no bad layers, ground detected - highest daytime quality; 2 - night, full column good, with detected lower layers with a bad layer; 3 - night, full column good, with bad lower layers; 4 - night, full column bad, includes only detected lower layers.; 5 - day, no full column, sum of all good layers, but bad layer present; 6 - night, full column good, but no ground detected; 7 - day, no full column, good or no layers, but no ground detected; 15 - invalid Notes: In the descriptions above 'full column' means the extinction retrieval from 20 km to d_aod_boht_4s. 'Bad layer' means a layer for which extinction could not be computed.</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 15</td> <td>night_highest_qual day_highest_qual night_bad_layer night_bad_layers night_only_lower day_bad_layer night_no_grnd day_no_grnd invalid</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 15 | night_highest_qual day_highest_qual night_bad_layer night_bad_layers night_only_lower day_bad_layer night_no_grnd day_no_grnd invalid | Rel 3: GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 15 | night_highest_qual day_highest_qual night_bad_layer night_bad_layers night_only_lower day_bad_layer night_no_grnd day_no_grnd invalid | | | | | | | | |
| i_pbl4_uf | INTEGER_1 (UNLIMITED) | PBL optical depth flag for 532 nm (NOT_SET) | NOT_SET | <p>Use Flag Meaning for PBL: 0 - none (use your default Sa); 1 - sulfate+carbon (67.5 sr); 2 - carbon (62.0 sr); 3 - salt+dust (32.5 sr); 4 - salt (28.5 sr); 5 - sulfate (60.0 sr); 6 - dust+carbon (58.1 sr); 7 - salt+dust+sulfate (47.2 sr); 8 - salt+carbon (49.1 sr); 9 - salt+sulfate (47.9 sr); 10 - dust (42.5 sr); 11 - salt+dust+carbon (48.2 sr); 12 - dust+sulfate (56.5 sr); 13 - salt+carbon+sulfate (53.3 sr); 14 - dust+carbon+sulfate (58.9 sr); 15 - all (52.3 sr)</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>none sul_c_67.5_sr c_62.0_sr salt_dust_32.5_sr salt_28.5_sr sul_60.0_sr dust_c_58.1_sr salt_dust_sul_47.2_sr salt_c_49.1_sr salt_sul_47.9_sr dust_42.5_sr salt_dust_c_48.2_sr dust_sul_56.5_sr salt_c_sul_53.3_sr dust_c_sul_58.9_sr all_52.3_sr</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | none sul_c_67.5_sr c_62.0_sr salt_dust_32.5_sr salt_28.5_sr sul_60.0_sr dust_c_58.1_sr salt_dust_sul_47.2_sr salt_c_49.1_sr salt_sul_47.9_sr dust_42.5_sr salt_dust_c_48.2_sr dust_sul_56.5_sr salt_c_sul_53.3_sr dust_c_sul_58.9_sr all_52.3_sr | Rel 3: GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | none sul_c_67.5_sr c_62.0_sr salt_dust_32.5_sr salt_28.5_sr sul_60.0_sr dust_c_58.1_sr salt_dust_sul_47.2_sr salt_c_49.1_sr salt_sul_47.9_sr dust_42.5_sr salt_dust_c_48.2_sr dust_sul_56.5_sr salt_c_sul_53.3_sr dust_c_sul_58.9_sr all_52.3_sr | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|--|--|---|---------|---|-------------------------|---------------|--|--|-------------------------|
| i_pb14_qf | INTEGER_1 (UNLIMITED) | PBL optical depth flag for 532 nm (NOT_SET) | NOT_SET | <p>Quality Flag Values: 0 = 0-5 % Error; 1 = 5-10 % Error; 2 = 10-15 % Error; 3 = 15-20 % Error; 4 = 20-25 % Error; 5 = 25-30 % Error; 6 = 30-35 % Error; 7 = 35-40 % Error; 8 = 40-45 % Error; 9 = 45-50 % Error; 10 = 50-55 % Error; 11 = 55-60 % Error; 12 = 60-65 % Error; 13 = 65-70 % Error; 14 = 70 and greater % Error; 15 = Unable to process</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>0-5_pcmt_err 5-10_pcmt_err 10-15_pcmt_err 15-20_pcmt_err 20-25_pcmt_err 25-30_pcmt_err 30-35_pcmt_err 35-40_pcmt_err 40-45_pcmt_err 45-50_pcmt_err 50-55_pcmt_err 55-60_pcmt_err 60-65_pcmt_err 65-70_pcmt_err 70_and_greater_pcmt_err no_proc</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 0-5_pcmt_err 5-10_pcmt_err 10-15_pcmt_err 15-20_pcmt_err 20-25_pcmt_err 25-30_pcmt_err 30-35_pcmt_err 35-40_pcmt_err 40-45_pcmt_err 45-50_pcmt_err 50-55_pcmt_err 55-60_pcmt_err 60-65_pcmt_err 65-70_pcmt_err 70_and_greater_pcmt_err no_proc | Rel 3: GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 0-5_pcmt_err 5-10_pcmt_err 10-15_pcmt_err 15-20_pcmt_err 20-25_pcmt_err 25-30_pcmt_err 30-35_pcmt_err 35-40_pcmt_err 40-45_pcmt_err 45-50_pcmt_err 50-55_pcmt_err 55-60_pcmt_err 60-65_pcmt_err 65-70_pcmt_err 70_and_greater_pcmt_err no_proc | | | | | | | | |
| i_aer4_uf | INTEGER_1 (UNLIMITED, 8) | Aerosol optical depth use flag for 532 nm (NOT_SET) | NOT_SET | <p>Aerosol Optical Depth Use Flag. The layers shown are ordered as follows. Layers 5-1 are the for the elevated aerosol layers below 20 km, with 5 the lowest and 1 the highest in altitude. Layers 8-6 are for the elevated aerosol layers above 20 km, with 6 the lowest and 8 the highest in altitude. For example if there were two elevated aerosol layers detected which were below 20 km, then the flags would be set for layers 5 and 4. In this case layer 4 is the highest elevated aerosol layer found. The Use flag meanings are different for the tropospheric (below 20 km) and the stratospheric (above 20 km) layers. Use Flag Meaning for tropospheric layers: 0 - none (use your default Sa); 1 - sulfate+carbon (67.5 sr); 2 - carbon (62.0 sr); 3 - salt+dust (32.5 sr); 4 - salt (28.5 sr); 5 - sulfate (60.0 sr); 6 - dust+carbon (58.1 sr); 7 - salt+dust+sulfate (47.2 sr); 8 - salt+carbon (49.1 sr); 9 - salt+sulfate (47.9 sr); 10 - dust (42.5 sr); 11 - salt+dust+carbon (48.2 sr); 12 - dust+sulfate (56.5 sr); 13 - salt+carbon+sulfate (53.3 sr); 14 - dust+carbon+sulfate (58.9 sr); 15 - all (52.3 sr). Use Flag Meanings for stratospheric layers: 12 - Stratospheric aerosol(non PSC layer whose top is > tropopause); 13 - PSC Type I; 14 - PSC Type II; 15 - Invalid</p> | Rel 3: GLAS Binary Data | | | | |
| i_aer4_qf | INTEGER_1 (UNLIMITED, 8) | Aerosol optical depth quality flag for 532 nm (NOT_SET) | NOT_SET | <p>Aerosol Optical Depth Quality Flag. The layers shown are ordered as follows. Layers 5-1 are the for the elevated aerosol layers below 20 km, with 5 the lowest and 1 the highest in altitude. Layers 8-6 are for the elevated aerosol layers above 20 km, with 6 the lowest and 8 the highest in altitude. For example if there were two elevated aerosol layers detected which were below 20 km, then the flags would be set for layers 5 and 4. In this case layer 4 is the highest elevated aerosol layer found. Quality Flag Values are the same for all layers: 0 = 0-5 % Error; 1 = 5-10 % Error; 2 = 10-15 % Error; 3 = 15-20 % Error; 4 = 20-25 % Error; 5 = 25-30 % Error; 6 = 30-35 % Error; 7 = 35-40 % Error; 8 = 40-45 % Error; 9 = 45-50 % Error; 10 = 50-55 % Error; 11 = 55-60 % Error; 12 = 60-65 % Error; 13 = 65-70 % Error; 14 = 70 and greater % Error; 15 = Unable to calculate error</p> | Rel 3: GLAS Binary Data | | | | |
| i_aer4_sval_uf | INTEGER_1 (UNLIMITED, 9) | Aerosol true S Values use flag (NOT_SET) | NOT_SET | <p>Aerosol true S values use flag for 9 layers at 1 per 4 sec. Stipulates which extinction to backscatter ratio was used in processing (1=default, 2=calculated and 15 denotes no layer detected (invalid)).</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>1, 2, 15</td> <td>default calculated no_layer_detected</td> </tr> </tbody> </table> | flag values | flag_meanings | 1, 2, 15 | default calculated no_layer_detected | Rel 3: GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 1, 2, 15 | default calculated no_layer_detected | | | | | | | | |

Group: Data_4s/Aerosol1064_OD

This group contains the 1064 aerosol Optical Depth parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-------------------|-----------------------|---|----------------|---|-------------------------|---------------|
| r_Aer_ir_bot | REAL (UNLIMITED, 2) | Elevation of Bottom of Aerosol Layers Detected in 1064 nm (NOT_SET) | meters | Elevation of Bottom of Aerosol Layers Detected in 1064 nm. | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_top | REAL (UNLIMITED, 2) | Elevation of Top of Aerosol Layers Detected in 1064 nm (NOT_SET) | meters | Elevation of Top of Aerosol Layers detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_bot_pres | REAL (UNLIMITED, 2) | Pressure of Bottom of Aerosol Layers Detected in 1064 nm (NOT_SET) | hPa | Pressure of Bottom of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_bot_relh | REAL (UNLIMITED, 2) | Relative Humidity of Bottom of Aerosol Layers Detected in 1064 nm (NOT_SET) | percent | Relative Humidity of Bottom of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_bot_temp | REAL (UNLIMITED, 2) | Temperature of Bottom of Aerosol Layers Detected in 1064 nm (NOT_SET) | degree Celsius | Temperature of Bottom of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_top_pres | REAL (UNLIMITED, 2) | Pressure of Top of Aerosol Layers Detected in 1064 nm (NOT_SET) | hPa | Pressure of Top of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_top_relh | REAL (UNLIMITED, 2) | Relative Humidity of Top of Aerosol Layers Detected in 1064 nm (NOT_SET) | percent | Relative Humidity of Top of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_top_temp | REAL (UNLIMITED, 2) | Temperature of Top of Aerosol Layers Detected in 1064 nm (NOT_SET) | degree Celsius | Temperature of Top of Aerosol Layers Detected in 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |
| r_Aer_ir_OD | REAL (UNLIMITED, 2) | Aerosol Optical Depth at 1064 nm (NOT_SET) | NOT_SET | Aerosol Optical Depth at 1064 nm | Rel 33 GLAS Binary Data | DS_UTCTime_4s |

Group: /Data_1HZ

This group contains data with a rate of 1HZ. 1Hz data may be indexed to the 40HZ data using the i_rec_ndx parameter in each respective time group.

Dimension Scales

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-------|-----------------------|---------------------------|-------|-------------|--------|-------------|
| | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-------------------|-----------------------|--|---------|---|----------------------------------|-------------|
| DS_UTCTime_1 | DOUBLE (UNLIMITED) | Transmit Time of First Shot in frame in J2000 (time) | seconds | The transmit time of the first shot in the 1 second frame measured as 'UTC seconds' elapsed since Jan 1 2000 12:00:00 UTC. This time has been derived from the GPS time accounting for leap seconds | Rel 33 GLAS Binary Data | NOT_SET |
| DS_Cloud_Layer_10 | INTEGER (UNLIMITED) | Cloud Layer Index (NOT_SET) | NOT_SET | This array contains the cloud layer index, up to 10 | Constants | NOT_SET |

Group: Data_1HZ/Time

This group contains the 1HZ index and time-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-----------|-----------------------|---------------------------|---------|---|----------------------------------|--------------|
| i_rec_ndx | INTEGER (UNLIMITED) | i4b (i_rec_ndx) | NOT_SET | Unique index that relates this record to the corresponding record(s) in each GLAS data product. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |

Group: Data_1HZ/Geolocation

This group contains geolocation-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-------|-----------------------|---|---------------|---|----------------------------------|--------------|
| d_lat | DOUBLE (UNLIMITED) | Profile Location, Latitude (at each time) (latitude) | degrees_north | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 1 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| d_lon | DOUBLE (UNLIMITED) | Profile Location, Longitude(at each time) (longitude) | degrees_east | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 1 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |

Group: Data_1HZ/RangeDelay

This group contains information relating to the atomsphere range delay.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | sol |
|-------|-----------------------|---------------------------------|-------------|--|-------------------------|
| r_erd | REAL (UNLIMITED) | Estimated Range Delay (NOT_SET) | millimeters | The estimated range delay is an estimate of the effect of atmospheric multiple scattering on the measured range as deduced from the surface pulse. Tables were created using the Monte Carlo method which contain the range delay as a function of height of scattering layer, geometrical thickness, optical thickness and particle size. The i_erd is provided to the elevation process as a range correction and is reported as a negative number that can be added to the range to correct it. The computation of i_erd is restricted to those times when the 532 channel was working sufficiently well (L2A and first half of L2B (also possibly for night L3A and L3B)). | Rel GL Bin Dat |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | sol |
|--------------------------------|-----------------------|--|-------------|--|---------------------------|
| r_rdu | REAL (UNLIMITED) | Range Delay Uncertainty (NOT_SET) | millimeters | Estimated uncertainty value in the range delay distance. | Rel GL/ Bin. Dat |
| r_pse | REAL (UNLIMITED) | Particle Size Estimate (NOT_SET) | microns | Particle size estimate used to calculate warning flag and range delay, 1 per second | Rel GL/ Bin. Dat |
| r_bs_erd | REAL (UNLIMITED) | Blowing Snow Range Delay (NOT_SET) | millimeters | Estimated range delay due to blowing snow. | Rel GL/ Bin. Dat |
| r_reflCor_atm | REAL (UNLIMITED) | Reflectivity Correction Factor For Atmospheric Effects (NOT_SET) | NOT_SET | This reflectance correction factor is calculated as $1 / e^{-(2(tc+ta+tp+tm))}$, where t_c is the cloud (column) integrated optical depth, t_a is the aerosol (column) integrated optical depth, t_p is the planetary boundary layer optical depth, and t_m is the molecular optical depth. t_m is a constant equal to $-\log(gd_T_RTatm)/2$, where $gd_T_RTatm = 0.98$ is defined in <code>const_elev_mod.f90</code> or read from ANC07-03. The reflectance has been corrected for waveform saturation. The reflectance correction factor is computed from the 532 nm channel and has been corrected for multiple scattering. | Rel GL/ Bin. Dat |
| r_reflct_1064od_1hz_cor | REAL (UNLIMITED) | 1 Hz 1064nm total column optical depth (NOT_SET) | NOT_SET | Total column 1064nm optical depth from surface reflectance corrected for multiple scattering. | Rel GL/ Bin. Dat |
| r_reflct_pristine_1hz | REAL (UNLIMITED) | 1064nm modeled surface reflectance (NOT_SET) | NOT_SET | Modeled (calculated) 1064nm surface reflectance from wind speed. | Rel GL/ Bin. Dat |
| r_reflct_1064msf_1hz | REAL (UNLIMITED) | 1 Hz 1064nm multiple scattering corr. factor (NOT_SET) | NOT_SET | Total column optical depth 1064nm multiple scattering correction factor. | Rel GL/ Bin. Dat |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | sol | | | | |
|---|--|--|---------|---|-------------|---------------|---|--|--------------------------|
| i_cld1_mswf | INTEGER_1 (UNLIMITED) | Cloud Multiple Scattering Warning Flag (NOT_SET) | NOT_SET | <p>Cloud Multiple Scattering Warning Flag at 1 Hz for 4 sec. First 4 bits are for first second, last 4 bits are for 4th second. The multiple scattering warning flag (MSWF) is based on the total column optical depth (aerosol plus cloud) calculated in GLA11 using 532nm. It is intended as a way to quickly obtain information about the potential severity of multiple scattering with regards to the range-to-surface calculated by the altimetry processing software. It will be output on the GLA11 product for use by the altimetry group. The multiple scattering warning flag will have values ranging from 0-14, based on the total column optical depth. A warning flag value of 15 will signify 'invalid'. An invalid will be encoded if an optical depth in any of the layers in the 1-second column could not be calculated. This usually occurs in a very optically-thick cloud which extinguishes the signal. It could also occur if the extinction-to-backscatter ratio assignment is set too high, causing the transmission calculations in the lidar inversion to go out-of-range.</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>less_than_0.01 0.01-0.03 0.03-0.06 0.06-0.1 0.1-0.15 0.15-0.225 0.225- 0.3 0.3-0.4 0.4-0.5 0.5-0.67 0.67- 0.9 0.9-1.2 1.2-1.6 1.6-2 greater_than_2 invalid</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | less_than_0.01 0.01-0.03 0.03-0.06 0.06-0.1 0.1-0.15 0.15-0.225 0.225- 0.3 0.3-0.4 0.4-0.5 0.5-0.67 0.67- 0.9 0.9-1.2 1.2-1.6 1.6-2 greater_than_2 invalid | Rel GL Bin. Dat |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | less_than_0.01 0.01-0.03 0.03-0.06 0.06-0.1 0.1-0.15 0.15-0.225 0.225- 0.3 0.3-0.4 0.4-0.5 0.5-0.67 0.67- 0.9 0.9-1.2 1.2-1.6 1.6-2 greater_than_2 invalid | | | | | | | | |
| i_blow_snow_conf | INTEGER_1 (UNLIMITED) | Blowing Snow Confidence (NOT_SET) | NOT_SET | <p>A number that indicates the degree of confidence that this is indeed blowing snow. Blowing snow confidence ranges from 0 - 15 and has the following meanings: 0: profile tested, but no blowing snow detected 1 - 5: Good blowing snow detection using the 1064 channel. 1 is lowest confidence that layer is blowing snow, 5 is highest confidence. 6: Layer suspected of being low cloud (such as fog), or seemingly too thick to be blowing snow (> 1.0 km thick) as determined from 1064 channel. 7 - 12: Good blowing snow detection using the 532 channel. 7 is lowest confidence that layer is blowing snow, 12 is highest confidence. 13: Layer suspected of being low cloud (such as fog), or seemingly too thick to be blowing snow (> 1.0 km thick) as determined from 532 channel. 14: Wind speed < 5 m/s or ground stroke not detected (the latter case indicating overlying thick cloud) 15: Signal not examined for blowing snow (could be because it is closer to the equator than plus or minus 60 degrees latitude, or not over sea ice or land)</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>no_b_s good_b_s_1064_1 good_b_s_1064_2 good_b_s_1064_3 good_b_s_1064_4 good_b_s_1064_5 suspctd_low_cl_1064 good_b_s_532_7 good_b_s_532_8 good_b_s_532_9 good_b_s_532_10 good_b_s_532_11 good_b_s_532_12 suspctd_low_cl_532 low_wind_sp_thick_cloud sig_not_exam</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | no_b_s good_b_s_1064_1 good_b_s_1064_2 good_b_s_1064_3 good_b_s_1064_4 good_b_s_1064_5 suspctd_low_cl_1064 good_b_s_532_7 good_b_s_532_8 good_b_s_532_9 good_b_s_532_10 good_b_s_532_11 good_b_s_532_12 suspctd_low_cl_532 low_wind_sp_thick_cloud sig_not_exam | Rel GL Bin. Dat |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | no_b_s good_b_s_1064_1 good_b_s_1064_2 good_b_s_1064_3 good_b_s_1064_4 good_b_s_1064_5 suspctd_low_cl_1064 good_b_s_532_7 good_b_s_532_8 good_b_s_532_9 good_b_s_532_10 good_b_s_532_11 good_b_s_532_12 suspctd_low_cl_532 low_wind_sp_thick_cloud sig_not_exam | | | | | | | | |

This group contains geophysical parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|----------------|-----------------------|--|----------------|---|-------------------------|--------------|
| r_cld1_grd_det | REAL (UNLIMITED) | Medium Resolution Ground Detection at 532 nm (NOT_SET) | meters | Medium resolution processed ground height at 1hz, 1 per profile | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_Surface_pres | REAL (UNLIMITED) | Surface Pressure (surface_air_pressure) | hPa | Surface Pressure, 4 of 1-second intervals. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_Surface_relh | REAL (UNLIMITED) | Surface Relative Humidity (relative_humidity) | percent | Surface Relative Humidity, 4 of 1-second intervals. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_Surface_temp | REAL (UNLIMITED) | Surface Temperature (surface_temperature) | degree Celsius | Surface Temperature, 4 of 1-second intervals. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_Surface_wdir | REAL (UNLIMITED) | Surface Wind Direction Azimuth from North (NOT_SET) | degrees | Surface wind direction azimuth from North, 4 of 1-second intervals. Wind direction at Earth's surface level measured in degrees of azimuth from North and derived from the meteorological data files. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_Surface_wind | REAL (UNLIMITED) | Surface Wind Speed (NOT_SET) | meters/second | Surface Wind Speed, 4 of 1-second intervals. Wind speed at Earth's surface level measured in km/hour and derived from the meteorological data files. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |

Group: Data_1HZ/Flags

This group contains flags indicating the quality or suitability of data.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates | | | | |
|-------------|-----------------------|---------------------------|---------|--|-------------|---------------|------|--------------------|-------------------------|--------------|
| surf_ld_flg | INTEGER_1 (UNLIMITED) | Region Type (NOT_SET) | NOT_SET | Region type;0=no Land;1=Land <table border="1" data-bbox="760 1570 1138 1707"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_land land</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_land land | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | no_land land | | | | | | | | | |
| surf_si_flg | INTEGER_1 (UNLIMITED) | Region Type (NOT_SET) | NOT_SET | Region type;0=no Sea Ice;1=Sea Ice <table border="1" data-bbox="760 1801 1138 1990"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_sea_ice sea_ice</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_sea_ice sea_ice | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | no_sea_ice sea_ice | | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates | | | | |
|--------------------|------------------------|---------------------------|---------|---|-------------|---------------|------|------------------------|-------------------------|--------------|
| surf_oc_flg | INTEGER_1 (UNLIMITED) | Region Type (NOT_SET) | NOT_SET | Region type;0=no Ocean;1=Ocean <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_ocean ocean</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_ocean ocean | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | no_ocean ocean | | | | | | | | | |
| surf_is_flg | INTEGER_1 (UNLIMITED) | Region Type (NOT_SET) | NOT_SET | Region type;0=no Ice Sheet;1=Ice Sheet <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_ice_sheet ice_sheet</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_ice_sheet ice_sheet | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1 | no_ice_sheet ice_sheet | | | | | | | | | |

Group: Data_1HZ/Quality

This group contains flags indicating the quality or suitability of data.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|------------------------|---|---------------------------------|---------|---|-------------|---------------|---------|---|------------------------|
| orbit_pred_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | Predicted or precision orbit;0=precision orbit used;1=predicted orbit used;2=on-board orbit used <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1, 2</td> <td>precision_orbit_used predicted_orbit_used on-board_orbit_used</td> </tr> </table> | flag values | flag_meanings | 0, 1, 2 | precision_orbit_used predicted_orbit_used on-board_orbit_used | Rel 3 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2 | precision_orbit_used predicted_orbit_used on-board_orbit_used | | | | | | | | |
| orbit_man_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | Maneuvers;0=no maneuvers;1=maneuvers occurred during this record; orbit degraded <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_maneuvers maneuvers orbit_degraded</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_maneuvers maneuvers orbit_degraded | Rel 3 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | no_maneuvers maneuvers orbit_degraded | | | | | | | | |
| orbit_model_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | Model problems;0=no model problems;1=model problems; orbit RMS > 5 cm; required accuracy not met <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_problems problems</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_problems problems | Rel 3 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | no_problems problems | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|-------------------------|---|------------------------------------|---------|--|-------------|---------------|------|---|--------------------------------|
| orbit_att_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | Attitude;0=instrument attitude used for orbit;1=modeled attitude used, possible orbit degradation <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>instrument_attitude_used modeled_attitude_used possible_orbit_degradation</td> </tr> </table> | flag values | flag_meanings | 0, 1 | instrument_attitude_used modeled_attitude_used possible_orbit_degradation | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | instrument_attitude_used modeled_attitude_used possible_orbit_degradation | | | | | | | | |
| orbit_array_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | Solar ray orientation;0=solar ray orientation used from measurement;1=modeled solar ray orientation, possible orbit degradation <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>solar_ray_orientation_from_measurement modeled_solar_ray_orientation</td> </tr> </table> | flag values | flag_meanings | 0, 1 | solar_ray_orientation_from_measurement modeled_solar_ray_orientation | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | solar_ray_orientation_from_measurement modeled_solar_ray_orientation | | | | | | | | |
| orbit_gps_flg | INTEGER_1 (UNLIMITED) | POD flag (Orbit Flag) (NOT_SET) | NOT_SET | GPS;0=no GPS data outage;1=GPS data missing from portion of this record, possible degradation <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>no_GPS_data_outage GPS_data_missing</td> </tr> </table> | flag values | flag_meanings | 0, 1 | no_GPS_data_outage GPS_data_missing | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | no_GPS_data_outage GPS_data_missing | | | | | | | | |
| att_offnadir_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | Off-nadir angle; 0=off-nadir angle within limits;1=large off-nadir angle <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>within_limit outside_limits</td> </tr> </table> | flag values | flag_meanings | 0, 1 | within_limit outside_limits | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | within_limit outside_limits | | | | | | | | |
| att_oceansw_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | Ocean sweep;0=non-ocean sweep, 1=within time frame of ocean sweep <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>not_ocean_sweep ocean_sweep</td> </tr> </table> | flag values | flag_meanings | 0, 1 | not_ocean_sweep ocean_sweep | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | not_ocean_sweep ocean_sweep | | | | | | | | |
| att_pointing_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | Target of opportunity off-pointing;0=not within target of opportunity off-pointing 1=within time of target of opportunity off-pointing <table border="1"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>not_pointing pointing</td> </tr> </table> | flag values | flag_meanings | 0, 1 | not_pointing pointing | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | not_pointing pointing | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|-------------------------|--|---------------------------|---------|---|-------------|---------------|------------------------|--|--------------------------------|
| att_steering_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | Steering to reference track;0=not within target of opportunity off-pointing 1=within time of target of opportunity off-pointing <table border="1" data-bbox="818 273 1466 407"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>not_pointing pointing</td> </tr> </table> | flag values | flag_meanings | 0, 1 | not_pointing pointing | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | not_pointing pointing | | | | | | | | |
| att_actual_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | 0=i_AttFlg_1 through i_AttFlg_3 have been set based on actual data 1=i_AttFlg_1 through i_AttFlg_3 have not been set - IGNORE these flags <table border="1" data-bbox="818 558 1466 693"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1</td> <td>actual ignore</td> </tr> </table> | flag values | flag_meanings | 0, 1 | actual ignore | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | actual ignore | | | | | | | | |
| att_ist_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | IST data;0 = IST data is good 1 = Missing IST for at least a portion of the time of this frame 2 = Noisy IST for at least a portion of the time of this frame 3 = Noisy and missing IST for at least a portion of the time of this frame <table border="1" data-bbox="818 867 1466 1001"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1, 2, 3</td> <td>good missing noisy missing_noisy</td> </tr> </table> | flag values | flag_meanings | 0, 1, 2, 3 | good missing noisy missing_noisy | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3 | good missing noisy missing_noisy | | | | | | | | |
| att_gyro_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | GYRO data;0 = GYRO data is good 1 = Missing GYRO for at least a portion of the time of this frame 2 = Noisy GYRO for at least a portion of the time of this frame 3 = Noisy and missing GYRO for at least a portion of the time of this frame <table border="1" data-bbox="818 1178 1466 1312"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1, 2, 3</td> <td>good missing noisy missing_noisy</td> </tr> </table> | flag values | flag_meanings | 0, 1, 2, 3 | good missing noisy missing_noisy | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3 | good missing noisy missing_noisy | | | | | | | | |
| att_lrs_flg | INTEGER_1 (UNLIMITED) | Attitude Flag 1 (NOT_SET) | NOT_SET | LRS Data;0 = LRS data good, consists of star, laser and CRS 1 = LRS data good, but no star data for at least a portion of this frame 2 = LRS data good, but no laser data for at least a portion of this frame 3 = LRS data good, but no CRS data for at least a portion of this frame 4 = LRS data good, but only CRS data for at least a portion of this frame 5 = LRS data good, but only laser data for at least a portion of this frame 6 = LRS data good, but only star data for at least a portion of this frame 7 = Missing LRS for at least a portion of the time of this frame <table border="1" data-bbox="818 1602 1466 1791"> <tr> <td>flag values</td> <td>flag_meanings</td> </tr> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7</td> <td>good no_star no_laser no_crs only_crs only_laser only_star missing_lrs</td> </tr> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7 | good no_star no_laser no_crs only_crs only_laser only_star missing_lrs | Rel 3 GLAS Binar Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7 | good no_star no_laser no_crs only_crs only_laser only_star missing_lrs | | | | | | | | |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|------------------|-----------------------|------------------------------------|---------|--|-------------|---------------|------|-----------------|-------------------------|
| i_LidarQF | INTEGER_1 (UNLIMITED) | Lidar Frame quality flag (NOT_SET) | NOT_SET | Lidar frame quality flag. 0=good data, 1=data unsuitable for L2 processing due to weak 532 laser energy or high background. <table border="1" data-bbox="818 273 1466 407"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1</td> <td>good unsuitable</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1 | good unsuitable | Rel 33 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1 | good unsuitable | | | | | | | | |

Group: Data_1HZ/Angle

This group contains beam pointing angle information.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-----------------------|-----------------------|---------------------------|---------|---|-------------------------|--------------|
| r_beam_azimuth | REAL (UNLIMITED) | Azimuth (NOT_SET) | degrees | The direction, eastwards from north, of the laser beam vector as seen by an observer at the laser ground spot viewing toward the spacecraft (i.e., the vector from the ground to the spacecraft). When the spacecraft is precisely at the geodetic zenith, the value will be 99999 degrees. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_beam_coelev | REAL (UNLIMITED) | Co-elevation (NOT_SET) | degrees | Co-elevation (CE) is direction from vertical of the laser beam as seen by an observer located at the laser ground spot. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |
| r_pad_angle | REAL (UNLIMITED) | PAD Angle (NOT_SET) | degrees | Attitude angle calculated from PAD and POD. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |

Group: Data_1HZ/Reflectivity

This group contains reflectivity information.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|-----------------|-----------------------|---------------------------|---------|--|-------------------------|--------------|
| r_SolAng | REAL (UNLIMITED) | Solar Angle (NOT_SET) | Degrees | Solar Angle above or below the plane tangent to the ellipsoid surface at the laser spot. Positive values mean the sun is above the horizon, while negative values mean it is below the horizon. The effect of atmospheric refraction is not included. This is a low-precision value, with approximately one degree accuracy. | Rel 33 GLAS Binary Data | DS_UTCTime_1 |

Group: Data_1HZ/OD532CloudLayer

This group contains the 1HZ medium resolution 532 Optical Depth parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source |
|-------------------|-----------------------|--|--------|---|-------------------------|
| r_cld1_bot | REAL (UNLIMITED, 10) | Medium Resolution Cloud Bottom at 532 nm (NOT_SET) | meters | Medium resolution cloud bottom heights for layers which were selected for optical processing at 1hz, 1 per layer, 10 layers | Rel 33 GLAS Binary Data |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source |
|--------------------------|-----------------------|---|----------------|--|-------------------------|
| r_cld1_top | REAL (UNLIMITED, 10) | Medium Resolution Cloud Top at 532 nm (NOT_SET) | meters | Medium resolution cloud top heights for layers which were selected for optical processing at 1hz, 1 per layer, 10 layers | Rel 33 GLAS Binary Data |
| r_cld1_msf | REAL (UNLIMITED, 10) | Cloud Multiple Scattering Factor (NOT_SET) | NOT_SET | Cloud multiple scattering coefficient at 1 hz, 1 per layer up to 10 layers | Rel 33 GLAS Binary Data |
| r_cld1_od | REAL (UNLIMITED, 10) | Cloud Optical Depth at 532 nm (NOT_SET) | NOT_SET | 532 nm cloud optical depth, corrected for multiple scattering, at 1hz, up 10 layers | Rel 33 GLAS Binary Data |
| r_MRg_cldbot_pres | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Bottom Pressure (NOT_SET) | hPa | Medium Resolution 532 nm Cloud Bottom Pressure | Rel 33 GLAS Binary Data |
| r_MRg_cldbot_relh | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Bottom Relative Humidity (NOT_SET) | percent | Medium Resolution 532 nm Cloud Bottom Relative Humidity | Rel 33 GLAS Binary Data |
| r_MRg_cldbot_temp | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Bottom Temperature (NOT_SET) | degree Celsius | Medium Resolution 532 nm Cloud Bottom Temperature | Rel 33 GLAS Binary Data |
| r_MRg_cldtop_pres | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Top Pressure (NOT_SET) | hPa | Medium Resolution 532 nm Cloud Top Pressure | Rel 33 GLAS Binary Data |
| r_MRg_cldtop_relh | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Top Relative Humidity (NOT_SET) | percent | Medium Resolution 532 nm Cloud Top Relative Humidity | Rel 33 GLAS Binary Data |
| r_MRg_cldtop_temp | REAL (UNLIMITED, 10) | Medium Resolution 532 nm Cloud Top Temperature (NOT_SET) | degree Celsius | Medium Resolution 532 nm Cloud Top Temperature | Rel 33 GLAS Binary Data |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | | | | |
|--|--|---|---------|---|-------------|---------------|--|--|-------------------------|
| i_cld1_uf | INTEGER_1 (UNLIMITED, 10) | Cloud optical depth flag for 532 nm (NOT_SET) | NOT_SET | <p>for extinction cross section and layer optical depth, the use flag designates layer type category as follows for clouds: {based on average cloud temperature, water cloud is warmer than -13 C} Use Flag Meaning: 00 = less than or equal to -75.0 C; 01 = -75.0 through -68.5; 02 = -68.5 through -62.0; 03 = -62.0 through -55.5; 04 = -55.5 through -49.0; 05 = -49.0 through -32.5; 06 = -32.5 through -26.0; 07 = -26.0 through -19.5; 08 = -19.5 through -13.0; 09 = -13.0 through -6.5; 10 = -6.5 through 0.0; 11 = 0.0 through 6.5; 12 = 6.5 through 13.0; 13 = 13.0 through 19.5; 14 = greater than 19.5 C; 15 = invalid</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>up_to_-75_C -75_to_-68.5 -68.5_to_-62 -62_to_-55.5 -55.5_to_-49 -49_to_-32.5 -32.5_to_-26 -26_to_-19.5 -19.5_to_-13 -13_to_-6.5 -6.5_to_0 0_to_6.5 6.5_to_13 13_to_19.5 greater_than_19.5_C invalid</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | up_to_-75_C -75_to_-68.5 -68.5_to_-62 -62_to_-55.5 -55.5_to_-49 -49_to_-32.5 -32.5_to_-26 -26_to_-19.5 -19.5_to_-13 -13_to_-6.5 -6.5_to_0 0_to_6.5 6.5_to_13 13_to_19.5 greater_than_19.5_C invalid | Rel 33 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | up_to_-75_C -75_to_-68.5 -68.5_to_-62 -62_to_-55.5 -55.5_to_-49 -49_to_-32.5 -32.5_to_-26 -26_to_-19.5 -19.5_to_-13 -13_to_-6.5 -6.5_to_0 0_to_6.5 6.5_to_13 13_to_19.5 greater_than_19.5_C invalid | | | | | | | | |
| i_cld1_qf | INTEGER_1 (UNLIMITED, 10) | Cloud optical depth flag for 532 nm (NOT_SET) | NOT_SET | <p>Quality Flag Values: 0 = 0-5 % Error; 1 = 5-10 % Error; 2 = 10-15 % Error; 3 = 15-20 % Error; 4 = 20-25 % Error; 5 = 25-30 % Error; 6 = 30-35 % Error; 7 = 35-40 % Error; 8 = 40-45 % Error; 9 = 45-50 % Error; 10 = 50-55 % Error; 11 = 55-60 % Error; 12 = 60-65 % Error; 13 = 65-70 % Error; 14 = 70 and greater % Error; 15 = Unable to calculate error</p> <table border="1"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>0-5_pcnt_err 5-10_pcnt_err 10-15_pcnt_err 15-20_pcnt_err 20-25_pcnt_err 25-30_pcnt_err 30-35_pcnt_err 35-40_pcnt_err 40-45_pcnt_err 45-50_pcnt_err 50-55_pcnt_err 55-60_pcnt_err 60-65_pcnt_err 65-70_pcnt_err 70_and_greater_pcnt_err no_calc</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 0-5_pcnt_err 5-10_pcnt_err 10-15_pcnt_err 15-20_pcnt_err 20-25_pcnt_err 25-30_pcnt_err 30-35_pcnt_err 35-40_pcnt_err 40-45_pcnt_err 45-50_pcnt_err 50-55_pcnt_err 55-60_pcnt_err 60-65_pcnt_err 65-70_pcnt_err 70_and_greater_pcnt_err no_calc | Rel 33 GLAS Binary Data |
| flag values | flag_meanings | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 0-5_pcnt_err 5-10_pcnt_err 10-15_pcnt_err 15-20_pcnt_err 20-25_pcnt_err 25-30_pcnt_err 30-35_pcnt_err 35-40_pcnt_err 40-45_pcnt_err 45-50_pcnt_err 50-55_pcnt_err 55-60_pcnt_err 60-65_pcnt_err 65-70_pcnt_err 70_and_greater_pcnt_err no_calc | | | | | | | | |

Group: Data_1HZ/OD1064CloudLayers

This group contains the 1HZ medium resolution 1064 Optical Depth parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | co |
|-----------------------|-----------------------|--|--------|---|-------------------------|----|
| r_MRir_cld_bot | REAL (UNLIMITED, 10) | Elevation of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | meters | Elevation of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | co |
|---------------------------|-----------------------|--|----------------|---|-------------------------|----|
| r_MRir_cld_top | REAL (UNLIMITED, 10) | Elevation of Top of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | meters | Elevation of Top of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldbot_pres | REAL (UNLIMITED, 10) | Pressure of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | hPa | Pressure of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldbot_relh | REAL (UNLIMITED, 10) | Relative Humidity of Bottom of Cloud Layers Detected in 1064 nm at MR (NOT_SET) | percent | Relative Humidity of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldbot_temp | REAL (UNLIMITED, 10) | Temperature of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | degree Celsius | Temperature of Bottom of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldtop_pres | REAL (UNLIMITED, 10) | Pressure of Top of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | hPa | Pressure of Top of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldtop_relh | REAL (UNLIMITED, 10) | Relative Humidity of Top of Cloud Layers in 1064 nm at Medium Resolution (NOT_SET) | percent | Relative Humidity of Top of Cloud Layers in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |
| r_MRir_cldtop_temp | REAL (UNLIMITED, 10) | Temperature of Top of Cloud Layers Detected in 1064 nm at Medium Resolution (NOT_SET) | degree Celsius | Temperature of Top of Cloud Layers Detected in 1064 nm at Medium Resolution data rate. | Rel 33 GLAS Binary Data | DS |

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | co | | | | |
|--|--|---|---------|---|-------------------------|---------------|--|--|-------------------------|----|
| i_MRCir_af | INTEGER_1 (UNLIMITED) | Medium Resolution 1064 nm Cloud Layer QA Flag (NOT_SET) | NOT_SET | Availability flag. It provides the number of cloud layers determined from the 1064 nm data. value 0 = layers searched for but not detected; value 15 = cloud layers not searched for. <table border="1" data-bbox="841 300 1383 630"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>not_detected found_1 found_2 found_3 found_4 found_5 found_6 found_7 found_8 found_9 found_10 found_11 found_12 found_13 found_14 not_searched_for</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | not_detected found_1 found_2 found_3 found_4 found_5 found_6 found_7 found_8 found_9 found_10 found_11 found_12 found_13 found_14 not_searched_for | Rel 33 GLAS Binary Data | DS |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | not_detected found_1 found_2 found_3 found_4 found_5 found_6 found_7 found_8 found_9 found_10 found_11 found_12 found_13 found_14 not_searched_for | | | | | | | | | |
| i_MRir_QAFlag | INTEGER_1 (UNLIMITED, 10) | Medium Resolution 1064 nm Cloud Layer QA Flag (NOT_SET) | NOT_SET | Quality flag: value 15 = cloud layers were not searched for; value 0 = cloud layers were searched for but not detected; values 1-14 indicate increasing confidence of good cloud retrieval (value 1 = least confidence, value 14 = greatest confidence). <table border="1" data-bbox="841 835 1383 1249"> <thead> <tr> <th>flag values</th> <th>flag_meanings</th> </tr> </thead> <tbody> <tr> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15</td> <td>not_detected confidence_1 confidence_2 confidence_3 confidence_4 confidence_5 confidence_6 confidence_7 confidence_8 confidence_9 confidence_10 confidence_11 confidence_12 confidence_13 confidence_14 not_searched_for</td> </tr> </tbody> </table> | flag values | flag_meanings | 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | not_detected confidence_1 confidence_2 confidence_3 confidence_4 confidence_5 confidence_6 confidence_7 confidence_8 confidence_9 confidence_10 confidence_11 confidence_12 confidence_13 confidence_14 not_searched_for | Rel 33 GLAS Binary Data | DS |
| flag values | flag_meanings | | | | | | | | | |
| 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | not_detected confidence_1 confidence_2 confidence_3 confidence_4 confidence_5 confidence_6 confidence_7 confidence_8 confidence_9 confidence_10 confidence_11 confidence_12 confidence_13 confidence_14 not_searched_for | | | | | | | | | |
| r_cld_ir_OD | REAL (UNLIMITED, 10) | Cloud Optical Depth at 1064 nm (NOT_SET) | NOT_SET | Cloud Optical Depth at 1064 nm | Rel 33 GLAS Binary Data | DS | | | | |

Group: /Data_40HZ/

This group contain data with a rate of 40HZ. Data may be indexed to the 40HZ data using the `i_rec_ndx` parameter in each respective time group.

Dimension Scales

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|----------------------|-----------------------|--|---------|---|-------------------------|-------------|
| DS_UTCTime_40 | DOUBLE (UNLIMITED) | Transmit Time of First Shot in frame in J2000 (time) | seconds | The transmit time of each shot in the 1 second frame measured as 'UTC seconds' elapsed since Jan 1 2000 12:00:00 UTC. This time has been derived from the GPS time accounting for leap seconds. | Rel 33 GLAS Binary Data | NOT_SET |

Group: Data_40HZ/Time

This group contains the 40HZ index and time-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|---------------------|-----------------------|-----------------------------|---------|--|-------------------------|---------------|
| i_rec_ndx | INTEGER (UNLIMITED) | GLAS Record Index (NOT_SET) | NOT_SET | Unique index that relates this record to the corresponding record(s) in each GLAS data product. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |
| i_shot_count | INTEGER (UNLIMITED) | GLAS shot counter (NOT_SET) | NOT_SET | Identifies each laser shot within a record index. A combination of i_rec_ndx and i_shot_count can be used to uniquely identify each GLAS laser shot. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |

Group: Data_40HZ/Geolocation

This group contains geolocation-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|--------------|-----------------------|---|---------------|--|-------------------------|---------------|
| d_lat | DOUBLE (UNLIMITED) | Spot 1 Coordinate Data, Latitude Corrected (latitude) | degrees_north | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 40 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |
| d_lon | DOUBLE (UNLIMITED) | Spot 1 Coordinate Data, Longitude Corrected (longitude) | degrees_east | Profile coordinate in the IERS Terrestrial Reference Frame: east longitude and north latitude, at the 40 hertz rate. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |

Group: Data_40HZ/OpticalDepth

This group contains the optical depth-related parameters.

| Label | Datatype (Dimensions) | long_name (standard_name) | units | description | source | coordinates |
|----------------------------------|-----------------------|---|---------|---|-------------------------|---------------|
| r_reflect_1064od_40hz_cor | REAL (UNLIMITED) | 40 Hz 1064nm total column od (NOT_SET) | NOT_SET | Total column 1064nm optical depth from surface reflectance corrected for multiple scattering. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |
| r_reflect_1064msf_40hz | REAL (UNLIMITED) | 40 Hz 1064nm multiple scattering corr. factor (NOT_SET) | NOT_SET | Total column Optical Depth 1064nm multiple scattering correction factor. | Rel 33 GLAS Binary Data | DS_UTCTime_40 |

/ANCILLARY_DATA

/ANCILLARY_DATA

| Attribute | Example Value |
|---------------------------|---------------|
| glas_osc_rate | 1.000000023 |
| glas_osc_rate_date | 2003-10-30 |
| glas_osc_rate_time | 00:00:00 |

| Attribute | Example Value |
|---------------------------|--|
| sc_osc_rate | 0.9999998854809 |
| sc_osc_rate_date | 2003-10-30 |
| sc_osc_rate_time | 00:00:00 |
| internal_time_delay | 0.0000151100 |
| internal_time_delay_date | 2003-10-30 |
| internal_time_delay_time | 00:00:00 |
| internal_range_delay | 9.5560 |
| internal_range_delay_date | 2003-10-30 |
| internal_range_delay_time | 00:00:00 |
| Additional_Attribute | SP_ICE_PATH_NO, SP_ICE_GLAS_StartBlock, SP_ICE_GLAS_EndBlock, ReferenceOrbit, Track, PercentGroundHit, Cycle, Instance |
| internal_range_delay_desc | Internal range calibration bias determined during GLAS instrument integration testing and validated in-flight, meters. |
| internal_time_delay_desc | Internal time calibration bias determined during GLAS instrument integration testing and validated in-flight, seconds. |

/METADATA

/METADATA

| Attribute | Example Value |
|-------------|--|
| description | This group contains structured, computer-parseable ECHO-style collection and inventory-level metadata. |
| HDFVersion | HDF5 1.8.9 |
| ControlFile | cf_name=glal1_test.ct1 |

/METADATA/COLLECTIONMETADATA

| Attribute | Example Value |
|---------------------|------------------------------|
| DLLName | libDsESDTG1GLASPoly.001Sh.so |
| GranuleTimeDuration | 81280 |
| SpatialSearchType | Orbit |
| DataFileFormat | HDF5 |
| ScienceMimeType | application/x-hdfeos |
| BrowseMimeType | application/x-hdfeos |

| Attribute | Example Value |
|---------------------------------------|--|
| BrowseOnlineMimeType | image/jpeg |
| ShortName | GLAH11 |
| LongName | GLAS/ICESat L2 Global Thin Cloud/Aerosol Optical Depths Data (HDF5) |
| CollectionDescription | The level 2 thin cloud/aerosol data contains optical depths for clouds for up to 10 layers, the planetary boundary layer, and aerosols for up to 8 layers. Data granules will contain approximately 23 hours (14 orbits) of data. |
| VersionID | 33 |
| CitationforExternalPublication | The data used in this study were produced by the GLAS Science Team at the ICESat Science Investigator-led Processing System (I-SIPS) at NASA/GSFC. The data archive site is the NSIDC DAAC. |
| CollectionState | In Work |
| MaintenanceandUpdateFrequency | Daily |
| AccessConstraints | Data may not be reproduced or distributed without including the CitationForExternalPublication for this product included in this Metadata. Data may not be distributed in an altered form without the written permission of the GLAS Science Team. |
| TemporalKeyword | Day |
| SpatialKeyword | Global |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes

| Attribute | Example Value |
|-------------------------------|-------------------------------|
| PercentGroundHit | AdditionalAttributesContainer |
| Track | AdditionalAttributesContainer |
| Instrument_State | AdditionalAttributesContainer |
| ReferenceOrbit | AdditionalAttributesContainer |
| SP_ICE_PATH_NO | AdditionalAttributesContainer |
| SP_ICE_GLAS_StartBlock | AdditionalAttributesContainer |
| SP_ICE_GLAS_EndBlock | AdditionalAttributesContainer |
| Cycle | AdditionalAttributesContainer |
| Instance | AdditionalAttributesContainer |
| Instrument_State_Date | AdditionalAttributesContainer |
| Instrument_State_Time | AdditionalAttributesContainer |
| Timing_Bias | AdditionalAttributesContainer |
| Timing_Bias_Date | AdditionalAttributesContainer |

| Attribute | Example Value |
|----------------------------------|-------------------------------|
| Timing_Bias_Time | AdditionalAttributesContainer |
| identifier_product_doi | AdditionalAttributesContainer |
| identifier_file_uuid | AdditionalAttributesContainer |
| identifier_product_doi_authority | AdditionalAttributesContainer |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Cycle

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | A count of the number of exact repeats of this reference orbit. |
| AdditionalAttributeName | Cycle |
| ParameterUnitsofMeasurement | counts |
| ParameterRangeBegin | 0 |
| ParameterRangeEnd | 250 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Instance

| Attribute | Example Value |
|--------------------------------|--|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | The number of times that we have returned to a specific reference orbit. |
| AdditionalAttributeName | Instance |
| ParameterUnitsofMeasurement | counts |
| ParameterRangeBegin | 1 |
| ParameterRangeEnd | 99 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Instrument_State

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | Flag word that indicates which redundant units (laser, detector, oscillator) of the GLAS instrument are in operation. |
| AdditionalAttributeName | Instrument_State |
| ParameterUnitsofMeasurement | Flag word |
| ParameterRangeBegin | 0 |

| Attribute | Example Value |
|-------------------|---------------|
| ParameterRangeEnd | 5 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Instrument_State_Date

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | date |
| AdditionalAttributeDescription | The date that corresponds to the first valid Instrument_State. There is a maximum of two per granule. |
| AdditionalAttributeName | Instrument_State_Date |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Instrument_State_Time

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | time |
| AdditionalAttributeDescription | The time that corresponds to the first valid Instrument_State. There is a maximum of two per granule. |
| AdditionalAttributeName | Instrument_State_Time |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/PercentGroundHit

| Attribute | Example Value |
|--------------------------------|--|
| AdditionalAttributeDatatype | float |
| AdditionalAttributeDescription | Percent of data for this granule that had a detected ground return of the transmitted laser pulse. |
| AdditionalAttributeName | PercentGroundHit |
| ParameterUnitsofMeasurement | Percent |
| ParameterRangeBegin | 0.0 |
| ParameterRangeEnd | 100.0 |
| ParameterValueAccuracy | 1 |
| ParameterMeasurementResolution | 1 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/ReferenceOrbit

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | Assigned number for which exact orbital elements describe the exact repeat orbit pattern. |
| AdditionalAttributeName | ReferenceOrbit |
| ParameterUnitsofMeasurement | Assigned number |

| Attribute | Example Value |
|---------------------|---------------|
| ParameterRangeBegin | 1 |
| ParameterRangeEnd | 30000 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/SP_ICE_GLAS_EndBlock

| Attribute | Example Value |
|--------------------------------|--|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | Integer number within GLAS coverage scheme in which granule data ends. |
| AdditionalAttributeName | SP_ICE_GLAS_EndBlock |
| ParameterRangeBegin | 1 |
| ParameterRangeEnd | 360 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/SP_ICE_GLAS_StartBlock

| Attribute | Example Value |
|--------------------------------|--|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | Integer number within GLAS coverage scheme in which granule data starts. |
| AdditionalAttributeName | SP_ICE_GLAS_StartBlock |
| ParameterRangeBegin | 1 |
| ParameterRangeEnd | 360 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/SP_ICE_PATH_NO

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | Number which represents the GLAS path number. |
| AdditionalAttributeName | SP_ICE_PATH_NO |
| ParameterRangeBegin | 1 |
| ParameterRangeEnd | 32768 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Timing_Bias

| Attribute | Example Value |
|--------------------------------|--|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | The time tag error determined by the calibration team that was added to the time tags to compute the true time of data as provided on the granule. |

| Attribute | Example Value |
|-----------------------------|---------------|
| AdditionalAttributeName | Timing_Bias |
| ParameterUnitsofMeasurement | Microseconds |
| ParameterRangeBegin | -1000000 |
| ParameterRangeEnd | +1000000 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Timing_Bias_Date

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | date |
| AdditionalAttributeDescription | The date that corresponds to the first valid Timing_Bias. There are a maximum of two per granule. |
| AdditionalAttributeName | Timing_Bias_Date |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Timing_Bias_Time

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | time |
| AdditionalAttributeDescription | The time that corresponds to the first valid Timing_Bias. There are a maximum of two per granule. |
| AdditionalAttributeName | Timing_Bias_Time |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Track

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | int |
| AdditionalAttributeDescription | The unique number assigned for each repeat ground track (one orbit) of the reference orbit. |
| AdditionalAttributeName | Track |
| ParameterUnitsofMeasurement | counts |
| ParameterRangeBegin | 0 |
| ParameterRangeEnd | 3000 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/identifier_file_uuid

| Attribute | Example Value |
|--------------------------------|---|
| AdditionalAttributeDatatype | varchar |
| AdditionalAttributeDescription | Universally unique identifier for this data product's files |
| AdditionalAttributeName | identifier_file_uuid |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/identifier_product_doi

| Attribute | Example Value |
|---------------------------------------|--|
| AdditionalAttributeDatatype | varchar |
| AdditionalAttributeDescription | Digital object identifier that uniquely identifies this data product |
| AdditionalAttributeName | identifier_product_doi |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/identifier_product_doi/InformationContent

| Attribute | Example Value |
|-----------------------|-----------------------------|
| ParameterValue | 10.5067/ICESAT/GLAS/DATA204 |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/identifier_product_doi_authority

| Attribute | Example Value |
|---------------------------------------|--|
| AdditionalAttributeDatatype | varchar |
| AdditionalAttributeDescription | URL of the digital object identifier resolving authority |
| AdditionalAttributeName | identifier_product_doi_authority |

/METADATA/COLLECTIONMETADATA/AdditionalAttributes/identifier_product_doi_authority/InformationContent

| Attribute | Example Value |
|-----------------------|---|
| ParameterValue | http://dx.doi.org/10.5067/ICESAT/GLAS/DATA204 |

/METADATA/COLLECTIONMETADATA/CSDTDescription

| Attribute | Example Value |
|--------------------------|---|
| PrimaryCSDT | n-Dim Array of Records |
| IndirectReference | tracks/orbits |
| Implementation | HDF |
| CSDTComments | Granule contains fourteen orbits of data; nominally 24-hr period. |

/METADATA/COLLECTIONMETADATA/CollectionAssociation

| Attribute | Example Value |
|---------------|--------------------------------|
| GLA00 | CollectionAssociationContainer |
| GLAH02 | CollectionAssociationContainer |
| GLAH07 | CollectionAssociationContainer |
| GLAH09 | CollectionAssociationContainer |
| GLAH08 | CollectionAssociationContainer |

| Attribute | Example Value |
|-----------|--------------------------------|
| GLAH10 | CollectionAssociationContainer |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLA00

| Attribute | Example Value |
|----------------|--|
| CollectionType | Science Associated |
| CollectionUse | The initial collection of GLAS instrument data downlinked from the spacecraft. |
| ShortName | GLA00 |
| VersionID | 1 |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLAH02

| Attribute | Example Value |
|----------------|--|
| CollectionType | Science Associated |
| CollectionUse | Level 1A atmospheric data product file containing: normalized lidar signals. |
| ShortName | GLAH02 |
| VersionID | 33 |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLAH07

| Attribute | Example Value |
|----------------|--|
| CollectionType | Input |
| CollectionUse | Level 1B file containing: calibrated backscatter profiles. |
| ShortName | GLAH07 |
| VersionID | 33 |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLAH08

| Attribute | Example Value |
|----------------|---|
| CollectionType | Input |
| CollectionUse | Level 2 file containing: planetary boundary layer heights and aerosol layer top and bottom. |
| ShortName | GLAH08 |
| VersionID | 33 |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLAH09

| Attribute | Example Value |
|-----------|---------------|
|-----------|---------------|

| Attribute | Example Value |
|----------------|--|
| CollectionType | Input |
| CollectionUse | Level 2 file containing: cloud layer top and bottom heights. |
| ShortName | GLAH09 |
| VersionID | 33 |

/METADATA/COLLECTIONMETADATA/CollectionAssociation/GLAH10

| Attribute | Example Value |
|----------------|---|
| CollectionType | Science Associated |
| CollectionUse | Level 2 file containing: cloud- and aerosol- attenuation corrected backscatter and extinction profiles. |
| ShortName | GLAH10 |
| VersionID | 33 |

/METADATA/COLLECTIONMETADATA/ContactOrganization

| Attribute | Example Value |
|-----------------|------------------------------|
| Data_Originator | ContactOrganizationContainer |
| Archive | ContactOrganizationContainer |

/METADATA/COLLECTIONMETADATA/ContactOrganization/Archive

| Attribute | Example Value |
|-------------------------|--|
| Role | Archive |
| HoursofService | M-F, 8:00am to 5:00pm, Mountain Time |
| ContactInstructions | For inquiries, contact NSIDC User Services. Primary first level contact. |
| ContactOrganizationName | NSIDC User Services |
| StreetAddress | CIRES/NSIDC University of Colorado Campus, Box 449 |
| City | Boulder |
| StateProvince | Colorado |
| PostalCode | 80309-0449 |
| Country | USA |
| TelephoneNumber | 303-492-2468 |
| TelephoneNumberType | Facsimile |
| ElectronicMailAddress | nsidc@nsidc.org |

/METADATA/COLLECTIONMETADATA/ContactOrganization/Data_Originator

| Attribute | Example Value |
|-------------------------|--|
| Role | Data Originator |
| HoursofService | M-F, 8:00am to 4:30pm Eastern Time |
| ContactInstructions | Contact by e-mail first |
| ContactOrganizationName | ICESat Science Investigator-led Processing System (I-SIPS) |
| StreetAddress | Building 33, NASA Goddard Space Flight Center |
| City | Greenbelt |
| StateProvince | Maryland |
| PostalCode | 20771 |
| Country | USA |
| TelephoneNumber | 757-864-1238 |
| TelephoneNumberType | Voice |
| ElectronicMailAddress | David.W.Hancock@nasa.gov |

/METADATA/COLLECTIONMETADATA/ContactPerson

| Attribute | Example Value |
|-----------|------------------------|
| Hancock | ContactPersonContainer |
| Schutz | ContactPersonContainer |
| Zwally | ContactPersonContainer |
| DiMarzio | ContactPersonContainer |

/METADATA/COLLECTIONMETADATA/ContactPerson/DiMarzio

| Attribute | Example Value |
|---------------------|---|
| Role | Producer |
| HoursofService | M-F, 8:00am to 4:30pm Eastern Time |
| ContactInstructions | None |
| ContactJobPosition | Deputy Science Software Development Manager |
| ContactFirstName | John |
| ContactMiddleName | P |
| ContactLastName | DiMarzio |

| Attribute | Example Value |
|-----------------------|------------------------------------|
| StreetAddress | Building 33, Rm. B-209D, NASA/GSFC |
| City | Greenbelt |
| StateProvince | Maryland |
| PostalCode | 20771 |
| Country | USA |
| TelephoneNumber | 301-614-5893 |
| TelephoneNumberType | Voice |
| ElectronicMailAddress | John.P.Dimarzio.1@nasa.gov |

/METADATA/COLLECTIONMETADATA/ContactPerson/Hancock

| Attribute | Example Value |
|-----------------------|--|
| Role | Data Originator |
| HoursofService | M-F, 8:00am to 4:30pm. Eastern Time. |
| ContactInstructions | None |
| ContactJobPosition | Science Software Development Manager. |
| ContactFirstName | David |
| ContactMiddleName | W. |
| ContactLastName | Hancock |
| StreetAddress | Building N-159, NASA/GSFC Wallops Flight Facility. |
| City | Wallops Island |
| StateProvince | Virginia |
| PostalCode | 23337 |
| Country | USA |
| TelephoneNumber | 757-824-1238 |
| TelephoneNumberType | Voice |
| ElectronicMailAddress | David.W.Hancock@nasa.gov |

/METADATA/COLLECTIONMETADATA/ContactPerson/Schutz

| Attribute | Example Value |
|-----------|---------------|
| Role | Investigator |

| Attribute | Example Value |
|-----------------------|--|
| HoursofService | M-F, 8:00am to 4:30pm Central Time |
| ContactInstructions | None |
| ContactJobPosition | GLAS Science Team Leader |
| ContactFirstName | Bob |
| ContactMiddleName | E |
| ContactLastName | Schutz |
| StreetAddress | 3925 W. Braker Lane, Center for Space Research |
| City | Austin |
| StateProvince | Texas |
| PostalCode | 78759-5321 |
| Country | USA |
| TelephoneNumber | 512-471-4267 |
| TelephoneNumberType | Voice |
| ElectronicMailAddress | schutz@utcsr.ae.utexas.edu |

/METADATA/COLLECTIONMETADATA/ContactPerson/Zwally

| Attribute | Example Value |
|---------------------|------------------------------------|
| Role | Producer |
| HoursofService | M-F, 8:00am to 4:30pm Eastern Time |
| ContactInstructions | None. |
| ContactJobPosition | ICESat Project Scientist |
| ContactFirstName | Jay |
| ContactLastName | Zwally |
| StreetAddress | Building 33, Rm A-217 |
| City | Greenbelt |
| StateProvince | Maryland |
| PostalCode | 20771 |
| Country | USA |
| TelephoneNumber | 301-614-5643 |

| Attribute | Example Value |
|-----------------------|---------------------|
| TelephoneNumberType | Voice |
| ElectronicMailAddress | Jay.Zwally@nasa.gov |

/METADATA/COLLECTIONMETADATA/DisciplineTopicParameters

| Attribute | Example Value |
|------------|------------------------------------|
| Atmosphere | DisciplineTopicParametersContainer |

/METADATA/COLLECTIONMETADATA/DisciplineTopicParameters/Atmosphere

| Attribute | Example Value |
|----------------------|---------------------------------|
| ECSDisciplineKeyword | Earth Science |
| ECSTopicKeyword | Atmosphere |
| ECSTermKeyword | Aerosols |
| ECSVariableKeyword | Aerosol Optical Depth/Thickness |

/METADATA/COLLECTIONMETADATA/ECSCollection

| Attribute | Example Value |
|--|--|
| RevisionDate | 2012-06-25 |
| SuggestedUsage | The purpose of GLAH11 is to provide the thin cloud/aerosol optical depth data to researchers. Cloud data are provided at 1Hz and aerosol data are provided at .25Hz. Each GLAH11 file was created from an equivalent GLA11 binary file. The data used to create the GLAH11 values are contained in the equivalent GLAHxx files for the GLAxx files. See the provenance metadata for the creation of the GLA11. |
| ProcessingCenter | GSFC I-SIPS |
| ArchiveCenter | NSIDC |
| VersionDescription | Initial Version |
| DatasetDisclaimerPointer | http://nsidc.org/data/icesat/disclaimer.html |
| ECSCollectionGuidePointer | https://nsidc.org/data/glah02-glah07-glah08-glah09-glah10-glah11/versions/33/documentation |
| ECSCollectionGuidePointerComment | Guide Document for this product at NSIDC |
| MiscellaneousInformationPointer | http://nsidc.org/data/icesat/ |
| MiscellaneousInformationPointerComment | GLAS Product page at NSIDC |

/METADATA/COLLECTIONMETADATA/Platform

| Attribute | Example Value |
|-----------|---------------|
|-----------|---------------|

| Attribute | Example Value |
|-----------|-------------------|
| ICESat | PlatformContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat

| Attribute | Example Value |
|-------------------|--|
| PlatformShortName | ICESat |
| PlatformLongName | Ice, Cloud, and Land Elevation Satellite |
| PlatformType | Spacecraft |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument

| Attribute | Example Value |
|-----------|---------------------|
| GLAS | InstrumentContainer |
| GPS | InstrumentContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS

| Attribute | Example Value |
|---------------------|---|
| InstrumentShortName | GLAS |
| InstrumentLongName | Geoscience Laser Altimeter System |
| InstrumentTechnique | Laser Altimetry and Light Detection and Radar |
| NumberOfSensors | 3 |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/InstrumentCharacteristic

| Attribute | Example Value |
|------------|-----------------------------------|
| SwathWidth | InstrumentCharacteristicContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/InstrumentCharacteristic/SwathWidth

| Attribute | Example Value |
|-------------------------------------|---|
| InstrumentCharacteristicName | SwathWidth |
| InstrumentCharacteristicDescription | The width of the sensor scan as the satellite moves along the ground track. |
| InstrumentCharacteristicDataType | int |
| InstrumentCharacteristicUnit | kilometers |
| InstrumentCharacteristicValue | 2 |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor

| | |
|--|--|
| | |
|--|--|

| Attribute | Example Value |
|-----------|-----------------|
| LA | SensorContainer |
| PC | SensorContainer |
| CD | SensorContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/CD

| Attribute | Example Value |
|-----------------|--|
| SensorShortName | CD |
| SensorLongName | Cloud LIDAR |
| SensorTechnique | Measure of 1064nm return energy in 75m bins from 20km to surface |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/CD/SensorCharacteristic

| Attribute | Example Value |
|------------|-------------------------------|
| wavelength | SensorCharacteristicContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/CD/SensorCharacteristic/wavelength

| Attribute | Example Value |
|---------------------------------|---------------|
| SensorCharacteristicName | wavelength |
| SensorCharacteristicDescription | detector |
| SensorCharacteristicDataType | varchar |
| SensorCharacteristicUnit | nanometer |
| SensorCharacteristicValue | 1064 nm |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/LA

| Attribute | Example Value |
|-----------------|--|
| SensorShortName | LA |
| SensorLongName | Laser Altimeter |
| SensorTechnique | Exact Measurement of Time between Transmit Pulse and receive ground return |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/LA/SensorCharacteristic

| Attribute | Example Value |
|------------|-------------------------------|
| wavelength | SensorCharacteristicContainer |
| waveform | SensorCharacteristicContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/LA/SensorCharacteristic/waveform

| Attribute | Example Value |
|---------------------------------|---------------|
| SensorCharacteristicName | waveform |
| SensorCharacteristicDescription | digitizer |
| SensorCharacteristicDataType | varchar |
| SensorCharacteristicUnit | counts |
| SensorCharacteristicValue | 0-255 |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/LA/SensorCharacteristic/wavelength

| Attribute | Example Value |
|---------------------------------|---------------|
| SensorCharacteristicName | wavelength |
| SensorCharacteristicDescription | transmission |
| SensorCharacteristicDataType | varchar |
| SensorCharacteristicUnit | nanometer |
| SensorCharacteristicValue | 1064 nm |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/PC

| Attribute | Example Value |
|-----------------|---|
| SensorShortName | PC |
| SensorLongName | Photon Counter for the 532 nm Aerosol Returns |
| SensorTechnique | Counting of 532nm photon return in 75m bins 40km to surface |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/PC/SensorCharacteristic

| Attribute | Example Value |
|------------|-------------------------------|
| wavelength | SensorCharacteristicContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GLAS/Sensor/PC/SensorCharacteristic/wavelength

| Attribute | Example Value |
|---------------------------------|---------------|
| SensorCharacteristicName | wavelength |
| SensorCharacteristicDescription | detector |
| SensorCharacteristicDataType | varchar |
| SensorCharacteristicUnit | nanometer |
| SensorCharacteristicValue | 532nm |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GPS

| Attribute | Example Value |
|---------------------|------------------------------------|
| InstrumentShortName | GPS |
| InstrumentLongName | Global Positioning System Receiver |
| InstrumentTechnique | Radionavigation |
| NumberofSensors | 1 |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GPS/Sensor

| Attribute | Example Value |
|--------------|-----------------|
| GPS_Receiver | SensorContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/Instrument/GPS/Sensor/GPS_Receiver

| Attribute | Example Value |
|-----------------|-------------------------------|
| SensorShortName | GPS Receiver |
| SensorLongName | Dual frequency GPS receiver |
| SensorTechnique | Pseudorange and carrier phase |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/PlatformCharacteristic

| Attribute | Example Value |
|------------------|---------------------------------|
| OrbitInclination | PlatformCharacteristicContainer |
| OrbitalPeriod | PlatformCharacteristicContainer |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/PlatformCharacteristic/OrbitInclination

| Attribute | Example Value |
|-----------------------------------|--|
| PlatformCharacteristicName | OrbitInclination |
| PlatformCharacteristicDescription | Angle between the orbit plane and the Earth's equatorial plane |
| PlatformCharacteristicDataType | float |
| PlatformCharacteristicUnit | Degrees |
| PlatformCharacteristicValue | 94.0 |

/METADATA/COLLECTIONMETADATA/Platform/ICESat/PlatformCharacteristic/OrbitalPeriod

| Attribute | Example Value |
|----------------------------|---------------|
| PlatformCharacteristicName | OrbitalPeriod |

| Attribute | Example Value |
|-----------------------------------|------------------------------------|
| PlatformCharacteristicDescription | Orbital period in decimal minutes. |
| PlatformCharacteristicDataType | float |
| PlatformCharacteristicUnit | Minutes |
| PlatformCharacteristicValue | 96.7 |

/METADATA/COLLECTIONMETADATA/ProcessingLevel

| Attribute | Example Value |
|----------------------------|---|
| ProcessingLevelDescription | Geophysical Quantities at the sensor resolution or geolocated |
| ProcessingLevelID | 2 |

/METADATA/COLLECTIONMETADATA/Review

| Attribute | Example Value |
|---------------------|---------------|
| ScienceReviewDate | 2001-03-04 |
| ScienceReviewStatus | QA at DAACs |
| FutureReviewDate | 2001-09-04 |

/METADATA/COLLECTIONMETADATA/Spatial

| Attribute | Example Value |
|-------------------------|---------------|
| SpatialCoverageType | Horizontal |
| WestBoundingCoordinate | -180.0 |
| NorthBoundingCoordinate | 90.0 |
| EastBoundingCoordinate | 180.0 |
| SouthBoundingCoordinate | -90.0 |

/METADATA/COLLECTIONMETADATA/StorageMediumClass

| Attribute | Example Value |
|---------------|---------------|
| StorageMedium | Online |

/METADATA/COLLECTIONMETADATA/Temporal

| Attribute | Example Value |
|-----------|---------------|
| TimeType | UTC |
| DateType | J2000 |

| Attribute | Example Value |
|--------------------|------------------|
| TemporalRangeType | Continuous Range |
| PrecisionofSeconds | 2 |
| EndsatPresentFlag | Y |
| RangeBeginningDate | 2003-01-13 |
| RangeBeginningTime | 00:00:00 |
| RangeEndingDate | 2010-01-13 |
| RangeEndingTime | 00:00:00 |

/METADATA/INVENTORYMETADATA

| Attribute | Example Value |
|--------------------|---------------|
| PGEVersion | Version 1.1 |
| ShortName | GLAH11 |
| VersionID | 33 |
| RangeBeginningTime | 01:51:38 |
| RangeEndingTime | 00:24:45 |
| RangeBeginningDate | 2003-11-18 |
| RangeEndingDate | 2003-11-19 |

/METADATA/INVENTORYMETADATA/ECSDDataGranule

| Attribute | Example Value |
|---------------------|---------------------------------------|
| ReprocessingPlanned | no further update anticipated |
| ReprocessingActual | reprocessed |
| LocalGranuleID | GLAH11_633_2103_002_0407_0_01_0001.H5 |
| ProductionDateTime | 2013-02-08T12:02:51 |
| LocalVersionID | 33 |

/METADATA/INVENTORYMETADATA/InputGranule

| Attribute | Example Value |
|--------------|---|
| InputPointer | glah11_test.ctl, tai-utc.dat, GLAH11_633_2103_002_0407_0_01_0001.P0310, DsESDTG1GLAH11.033.desc |

/METADATA/INVENTORYMETADATA/MeasuredParameter

| | |
|--|--|
| | |
|--|--|

| Attribute | Example Value |
|---------------|--|
| ParameterName | Cloud_Optical_Depth, Aerosol_Optical_Depth, Planetary_Boundary_Layer_Optical_Depth |

/METADATA/INVENTORYMETADATA/OrbitCalculatedSpatialDomain

| Attribute | Example Value |
|--------------------------|--|
| OrbitNumber | 4604, 4605, 4606, 4607, 4608, 4609, 4610, 4611, 4612, 4613, 4614, 4615, 4616, 4617, 4618 |
| StartOrbitNumber | 4604 |
| StopOrbitNumber | 4618 |
| EquatorCrossingLongitude | -103.22287, -127.41792, -151.61336, -175.8089, 159.99582, 135.80128, 111.6064, 87.41001, 63.21418, 39.01927, 14.825027, -9.368591, -33.562866, -57.758118, -81.95212 |
| EquatorCrossingTime | 01:38:10, 03:14:50, 04:51:29, 06:28:07, 08:04:46, 09:41:25, 11:18:05, 12:54:44, 14:31:22, 16:08:02, 17:44:42, 19:21:21, 20:58:00, 22:34:38, 00:11:17 |
| EquatorCrossingDate | 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-18, 2003-11-19 |

/METADATA/INVENTORYMETADATA/ProductSpecificMetadata

| Attribute | Example Value |
|----------------------------------|---|
| PercentGroundHit | 0 |
| Track | 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421 |
| Instrument_State | 373338 |
| ReferenceOrbit | 1 |
| SP_ICE_PATH_NO | 3429, 3430, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3440, 3441, 3442, 3443 |
| SP_ICE_GLAS_StartBlock | NOT SET |
| SP_ICE_GLAS_EndBlock | NOT SET |
| Cycle | 2 |
| Instance | 3 |
| Instrument_State_Date | 2003-10-30 |
| Instrument_State_Time | 00:00:00 |
| identifier_product_doi | 10.5067/ICESAT/GLAS/DATA204 |
| identifier_file_uuid | 599740C3-F062-4F49-A756-8A0DA37BC95B |
| identifier_product_doi_authority | http://dx.doi.org/10.5067/ICESAT/GLAS/DATA204 |

/METADATA/PROVENANCE

/METADATA/PROVENANCE/STEP_1

| Attribute | Example Value |
|-----------------|---------------------|
| ProcessDateTime | 2011-06-20T15:27:20 |

/METADATA/PROVENANCE/STEP_1/ProcessAgent

| Attribute | Example Value |
|-------------|---|
| Name | glas_atm |
| Type | 2 |
| Version | 6.0.1 |
| Description | This process is an instantiation of the GLAS Science Algorithm Software (GSAS) 2 ATBDs. |

/METADATA/PROVENANCE/STEP_1/ProcessInput

| Attribute | Example Value |
|-----------|---------------|
| | |

| Attribute | Example Value |
|----------------|---|
| Type | IN_CNTL, IN_ANC_TAIUTC, IN_GLA11, IN_ESDT |
| Version | 0, 0, 1, 1 |

/METADATA/PROVENANCE/STEP_2/ProcessOutput

| Attribute | Example Value |
|----------------|---|
| Name | out/GLAH11_633_2103_002_0407_0_01_0001.H5 |
| Type | OUT_GLAH11 |
| Version | 1 |
| UUID | 599740C3-F062-4F49-A756-8A0DA37BC95B |
| DOI | 10.5067/ICESAT/GLAS/DATA204 |

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