GLA08 Records: Release 33

Elevated Aerosol Layers

The Level-2 planetary boundary layer (PBL) and elevated aerosol layer heights product (GLA08) contains top and bottom heights of elevated aerosols below 20.5 km (4 sec sampling rate) up to five layers, and up to three layers between 20.5 km to 41 km (20 sec sampling rate).

Elevated aerosol layers are determined from 532 nm data. If a layer top is found above 20.5 km, but the bottom is below 20.5 km, the layer is treated as if it were above 20.5 km. You should examine the layer height flag values ("i_LayHgt_Flag," bytes 301-332) to view the number, quality, and type of layers found. The type is either "normal" aerosol or polar stratospheric cloud (PSC). The PSC flag is set only when the layer meets certain requirements for its average temperature, latitude, and height.

The quality flags ("i20_aer_qf" and "i4_aer_qf") assign a layer quality based on the ratio of the average signal *within* the layer, divided by the average *above* the layer. Values of "1" or "2" indicate a very tenuous layer with a higher chance of being a false positive. The maximum value for this flag is 13, which indicates a layer that contains very strong backscatter and is not likely to be a false positive.

Planetary Boundary Layer Height

Planetary Boundary Layer (PBL) height is determined at a 4 sec sampling rate from the 532 nm channel only. The PBL height is the lowest layer that can be resolved with the ground as its bottom. The PBL thickness (top minus ground height) cannot exceed 6 km. If the layer top is greater than 6 km above the local ground height, it is not identified as the PBL top. The PBL top is first searched by using a 4 sec average profile. If the top is found at that resolution, then the PBL top is located from each of the 20 (5 Hz) shots that make up that 4 sec period. Each PBL top retrieval is given a confidence rating similar to the elevated aerosol layer flag. The values run from "1" (lowest) to "13" (highest) confidence of a good PBL height retrieval. This number is computed by taking the ratio of the average signal *within* the PBL to the signal level *above* the PBL.

Values of 1-13 in "i_LayHgt_Flag" describe confidence levels of the quality of the height retrieval; "1" indicating very low confidence and "13" very high. A value of "14" indicates bad PBL height retrieval because of either bad input data or a mistake in the retrieval algorithm.

The PBL quality flag is computed from the ratio of the average signal (attenuated, calibrated backscatter) within the PBL to the average signal 500 m above the PBL. Normally, the backscatter increases significantly at the top of the PBL and remains higher within the PBL unless it is attenuated by a cloud, extremely dense dust, or smoke; thus, the quality flag is proportional to the

magnitude of the gradient of scattering at the PBL top. The larger this gradient, the easier it is to find the PBL top and hence the higher confidence in its detection.

The boundary layer at night over land collapses down to form the nocturnal boundary layer, usually 100 m or less in thickness. GLAS cannot pick this up, so over land at night if the boundary layer retrieval algorithm sees anything, it is certain to be the residual boundary layer from the day before.

See the GLAS Atmosphere Data Dictionary for details of each record, including units and scaling factors. The GLAS science team created this dictionary. Units and scaling factors with a "d" indicate double-precision constants; for example, a value of "1.0d5" is equivalent to 100,000. The variable "pe/bin" represents photo electrons per bin.

The following codes denote data types throughout the remainder of this document.

i1b: 1-byte integer
i2b: 2-byte (short) integer
i4b: 4-byte (long) integer
r4b: 4-byte real
r8b: 8-byte real

Values in parentheses indicate the record size, for example:

i2b (39): 39 records of 2-byte integers
i1b (48,40): 48-record x 40-record array of 1-byte integers

Nearly all integers are signed. Exceptions are noted in the following record table.

Table 1. GLA08 Records

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_rec_ndx	GLAS record index	0	i4b	4
i_UTCTime	Transmit time of first shot in frame in J2000 (referenced from noon on 01 January 2000)	4	i4b (2)	8
i_beam_coelev	Co-elevation	12	i4b (4)	16
i_beam_azimuth	Azimuth	28	i4b (4)	16
i_pad_angle	PAD angle	44	i4b (4)	16
i_spare0	Spares	60	i1b (40)	40

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_AttFlg1	Attitude flag	100	i2b (4)	8
i_lat	Profile location, latitude	108	i4b (4)	16
i_lon	Profile location, longitude	124	i4b (4)	16
i_OrbFlg	Orbit flag	140	i1b (2,4)	8
i_LidarQF	Lidar frame quality flag	152	i2b (4)	8
i_atm_dem	DEM value at current location from 1 km x 1 km grid	160	i4b (4)	16
i4_aer_bot	Below 20 km aerosol layer bottom	176	i2b (5)	10
i4_aer_top	Below 20 km aerosol layer top	186	i2b (5)	10
i20_aer_bot	20-40 km aerosol layer bottom	196	i2b (3)	6
i20_aer_top	20-40 km aerosol layer top	202	i2b (3)	6
i_LRpbl_ht	Low-resolution PBL height	208	i2b	2
i_LRpbl_grd	Ground detection for low-resolution PBL	210	i2b	2
i_HRpbl_ht	High-resolution PBL height	212	i2b (20)	40
i_HRpbl_grd	Ground detection for high-resolution PBL	252	i2b (20)	40
i4_aer_pct	Percentage of saturated bins in below 20 km aerosol layers	292	i1b (5)	5
i20_aer_pct	Percentage of saturated bins in 20-40 km aerosol layers	297	i1b (3)	3
i_LRpbl_pct	Percentage of saturated bins in low-resolution PBL layer	300	i1b	1
i_LayHgt_Flag	Layer height flag	301	i1b (32)	32
i_AttFlg3	Attitude flag 3	333	i1b	1
i_timecorflg	Time correction flag	334	i2b	2
i_SolarAngle	Solar angle	336	i4b (4)	16
i_Aer_top_b20_temp	Temperature of top of aerosol layers in bottom 20 km of atmosphere at 532 nm	352	i2b (5)	10
i_Aer_top_b20_pres	Pressure of top of aerosol layers in bottom 20 km of atmosphere at 532 nm	362	i2b (5)	10
i_Aer_top_b20_relh	Relative humidity of top of aerosol layers in bottom 20 km of atmosphere at 532 nm	372	i2b (5)	10

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_Aer_bot_b20_temp	Temperature of bottom of aerosol layers in bottom 20 km of atmosphere at 532 nm	382	i2b (5)	10
i_Aer_bot_b20_pres	Pressure of bottom of aerosol layers in bottom 20 km of atmosphere at 532 nm	392	i2b (5)	10
i_Aer_bot_b20_relh	Relative humidity of bottom of aerosol layers in bottom 20 km of atmosphere at 532 nm	402	i2b (5)	10
i_Aer_top_a20_temp	Temperature of top of aerosol layers above 20 km of atmosphere at 532 nm	412	i2b (3)	6
i_Aer_top_a20_pres	Pressure of top of aerosol layers above 20 km of atmosphere at 532 nm	418	i2b (3)	6
i_Aer_top_a20_relh	Relative humidity of top of aerosol layers above 20 km of atmosphere at 532 nm	424	i2b (3)	6
i_Aer_bot_a20_temp	Temperature of bottom of aerosol layers above 20 km of atmosphere at 532 nm	430	i2b (3)	6
i_Aer_bot_a20_pres	Pressure of bottom of aerosol layers above 20 km of atmosphere at 532 nm	436	i2b (3)	6
i_Aer_bot_a20_relh	Relative humidity of bottom of aerosol layers above 20 km of atmosphere at 532 nm	442	i2b (3)	6
i_Aer_PBL_LR_temp	Temperature of low resolution planetary boundary layer top at 532 nm	448	i2b	2
i_Aer_PBL_LR_pres	Pressure of low resolution planetary boundary layer top at 532 nm	450	i2b	2
i_Aer_PBL_LR_relh	Relative humidity of low resolution planetary boundary layer top at 532 nm	452	i2b	2
i_Aer_ir_top	Elevation of top of aerosol layers detected in 1064 nm	454	i2b (2)	4
i_Aer_ir_bot	Elevation of bottom of aerosol layers detected in 1064 nm	458	i2b (2)	4
i_Aer_ir_layflg	Layer flag for 1064 Aerosol	462	i1b (2)	2
i_Aer_ir_top_temp	Temperature of top of aerosol layers detected in 1064 nm	464	i2b (2)	4
i_Aer_ir_top_pres	Pressure of top of aerosol layers detected in 1064 nm	468	i2b (2)	4
i_Aer_ir_top_relh	Relative humidity of top of aerosol layers detected in 1064 nm	472	i2b (2)	4

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_Aer_ir_bot_temp	Temperature of bottom of aerosol layers detected in 1064 nm	476	i2b (2)	4
i_Aer_ir_bot_pres	Pressure of bottom of aerosol layers detected in 1064 nm	480	i2b (2)	4
i_Aer_ir_bot_relh	Relative humidity of bottom of aerosol layers detected in 1064 nm	484	i2b (2)	4
i_Surface_temp	Surface temperature	488	i2b (4)	8
i_Surface_pres	Surface pressure	496	i2b (4)	8
i_Surface_relh	Surface relative humidity	504	i2b (4)	8
i_Surface_wind	Surface wind speed	512	i2b (4)	8
i_Surface_wdir	Surface wind direction azimuth from north	520	i2b (4)	8
i_PBL_Layer_ht	PBL Layer Height from Met Data	528	i2b (4)	8
i_Spec_Humid	Specific Humidity	536	i2b (4)	8
i_Temp2mAbvGrnd	Temperature 2m Above Ground Level	544	i2b (4)	8
i_Total_CloudCov	Total Cloud Cover	552	i2b (4)	8
i_spare2	Spares	560	i1b (232)	232

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