GLA09 Records: Release 33

Cloud layer heights (GLA09) are determined from the 1064 nm and 532 nm channels. Heights from 532 nm are determined at four different sampling rates in the following order: 4 sec, 1 sec, 5 Hz, and 40 Hz. If a cloud layer height is found at 4 sec rate, then a search is performed at 1 sec rate. If a cloud layer height is found at 1 sec rate, then a search is performed at 5 Hz rate. Finally, if a cloud layer height is found at 5 Hz rate *and* the layer is below 4 km, then a search is performed at 40 Hz rate.

Cloud layer heights from 1064 nm are determined at 4 sec and 1 sec sampling rates. The search process is similar to that of 532 nm, whereby if a layer is found at 4 sec rate, then and only then, is the search performed at a 1 sec rate.

A maximum of 10 layers exists for each sampling rate, which imposes a limitation on the use of GLA09. At each resolution, a cloud layer flag indicates the number of layers detected, or the sum of the 532 nm layers plus the 1064 nm layers. These flags are "i_LRCL_Flag," "i_MRCL_Flag," "i_HRCL_Flag," and "i_FRCL_Flag."

Each layer also has a usage flag. The cloud layers found in the 532 nm data have a usage flag of "0," and the layers found in the 1064 nm data have a usage flag of "2"; thus, when looking at the 4 sec or 1 sec cloud layers in GLA09, you should view the usage flag to determine which channel was used to detect the layer. The layers detected from 532 nm will always be listed first, followed by the layers detected from 1064 nm. Duplication of layers may exist, meaning that a given layer is reported twice: once from 532 nm and once from 1064 nm, assuming that both channels are operating. If this occurs, the top and bottom of the layer should be slightly different, as two completely different algorithms are used to locate the layers; however, since the 532 nm channel is more sensitive than the 1064 nm channel, it should detect optically thin layers, resulting in some layers that were detected in 532 nm to go undetected in the 1064 nm channel.

A ground return search also runs for each of the four horizontal resolutions. The presence or absence of a ground return must be used to determine if the bottom of the last (lowest) discovered cloud layer is valid.

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.

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
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_surfType	Region type	148	i1b (4)	4
i_LidarQF	Lidar frame quality flag	152	i2b (4)	8
i_spare2	Spares	160	i1b (8)	8
i_topo_elev	Topographic elevation of surface above geoid	168	i4b (4)	16
i_atm_dem	DEM value at current location from 1 km x 1 km grid	184	i4b (4)	16
i_LRcld_bot	Low-resolution cloud bottom	200	i2b (10)	20
i_LRcld_top	Low-resolution cloud top	220	i2b (10)	20
i_LRcld_grd	Low-resolution ground detection	240	i2b	2
i_spare3	Spares	242	i1b (2)	2

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_MRcld_bot	Medium-resolution cloud bottom	244	i2b (10,4)	80
i_MRcld_top	Medium-resolution cloud top	324	i2b (10,4)	80
i_MRcld_grd	Medium-resolution ground detection	404	i2b (4)	8
i_MRcld_pct	Percentage of saturated bins in medium-resolution cloud layers	412	i1b (10,4)	40
i_HRcld_bot	High-resolution cloud bottom	452	i2b (10,20)	400
i_HRcld_top	High-resolution cloud top	852	i2b (10,20)	400
i_HRcld_grd	High-resolution ground detection	1252	i2b (20)	40
i_FRcld_bot	Full-resolution cloud bottom	1292	i2b (160)	320
i_FRcld_top	Full-resolution cloud top	1612	i2b (160)	320
i_FRcld_grd	Full-resolution cloud ground detection	1932	i2b (160)	320
i_FRg_grd_sig	Full-resolution ground return signal at 532 nm	2252	i4b (160)	640
i_FRir_grd_sig	Full-resolution ground return signal at 1064 nm	2892	i4b (160)	640
i_LRCL_Flag	Low-resolution cloud layers flag	3532	i1b (11)	11
i_MRCL_Flag	Medium-resolution cloud layers flag	3543	i1b (37)	37
i_HRCL_Flag	High-resolution cloud layers flag	3580	i1b (185)	185
i_FRCL_Flag	Full-resolution cloud layers flag	3765	i1b (220)	220
i_AttFlg3	Attitude flag 3	3985	i1b	1
i_timecorflg	Time correction flag	3986	i2b	2
i_FRir_cldtop	Full resolution 1064 cloud top	3988	i2b (160)	320
i_FRir_qaFlag	Full resolution 1064 quality flag	4308	i1b (160)	160
i_FRir_intsig	Full resolution 1064 integrated signal	4468	i2b (160)	320
i_SolarAngle	Solar angle	4788	i4b (4)	16
i_LRir_cld_top	Elevation of top of cloud layers detected in 1064 nm at low resolution	4804	i2b (10)	20

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_LRir_cld_bot	Elevation of bottom of cloud layers detected in 1064 nm at low resolution	4824	i2b (10)	20
i_LRir_QAflag	Low resolution 1064 nm cloud layer QA flag	4844	i1b (10)	10
i_LRir_cldtop_temp	Temperature of top of cloud layers detected in 1064 nm at low resolution	4854	i2b (10)	20
i_LRir_cldtop_pres	Pressure of top of cloud layers detected in 1064 nm at low resolution	4874	i2b (10)	20
i_LRir_cldtop_relh	Relative humidity of top of cloud layers detected in 1064 nm at low resolution	4894	i2b (10)	20
i_LRir_cldbot_temp	Temperature of bottom of cloud layers detected in 1064 nm at low resolution	4914	i2b (10)	20
i_LRir_cldbot_pres	Pressure of bottom of cloud layers detected in 1064 nm at low resolution	4934	i2b (10)	20
i_LRir_cldbot_relh	Relative humidity of bottom of cloud layers detected in 1064 nm low resolution	4954	i2b (10)	20
i_MRir_cld_top	Elevation of top of cloud layers detected in 1064 nm at medium resolution	4974	i2b (10, 4)	80
i_MRir_cld_bot	Elevation of bottom of cloud layers detected in 1064 nm at medium resolution	5054	i2b (10, 4)	80
i_MRir_QAflag	Medium resolution 1064 nm cloud layer QA flag	5134	i1b (40)	40
i_MRir_cldtop_temp	Temperature of top of cloud layers detected in 1064 nm at medium resolution	5174	i2b (10, 4)	80
i_MRir_cldtop_pres	Pressure of top of cloud layers detected in 1064 nm at medium resolution	5254	i2b (10, 4)	80
i_MRir_cldtop_relh	Relative humidity of top of cloud layers in 1064 nm at medium resolution	5334	i2b (10, 4)	80
i_MRir_cldbot_temp	Temperature of bottom of cloud layers detected in 1064 nm at medium resolution	5414	i2b (10, 4)	80
i_MRir_cldbot_pres	Pressure of bottom of cloud layers detected in 1064 nm at medium resolution	5494	i2b (10, 4)	80
i_MRir_cldbot_relh	Relative humidity of bottom of cloud layers detected in 1064 nm at MR	5574	i2b (10, 4)	80

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_LRg_cldtop_temp	Low resolution 532 nm cloud top temperature	5654	i2b (10)	20
i_LRg_cldtop_pres	Low resolution 532 nm cloud top pressure	5674	i2b (10)	20
i_LRg_cldtop_relh	Low resolution 532 nm cloud top relative humidity	5694	i2b (10)	20
i_LRg_cldbot_temp	Low resolution 532 nm cloud bottom temperature	5714	i2b (10)	20
i_LRg_cldbot_pres	Low resolution 532 nm cloud bottom pressure	5734	i2b (10)	20
i_LRg_cldbot_relh	Low resolution 532 nm cloud bottom relative humidity	5754	i2b (10)	20
i_MRg_cldtop_temp	Medium resolution 532 nm cloud top temperature	5774	i2b (10, 4)	80
i_MRg_cldtop_pres	Medium resolution 532 nm cloud top pressure	5854	i2b (10, 4)	80
i_MRg_cldtop_relh	Medium resolution 532 nm cloud top relative humidity	5934	i2b (10, 4)	80
i_MRg_cldbot_temp	Medium resolution 532 nm cloud bottom temperature	6014	i2b (10, 4)	80
i_MRg_cldbot_pres	Medium resolution 532 nm cloud bottom pressure	6094	i2b (10, 4)	80
i_MRg_cldbot_relh	Medium resolution 532 nm cloud bottom relative humidity	6174	i2b (10, 4)	80
i_LRg_SourceFt	Low resolution data 532 nm source function	6254	i2b	2
i_MRg_SourceFt	Medium resolution data 532 nm source function	6256	i2b (4)	8
i_HRg_SourceFt	High resolution data 532 nm source function	6264	i2b (20)	40
i_LRir_SourceFt	Low resolution data 1064 nm source function	6304	i2b	2
i_MRir_SourceFt	Medium resolution data 1064 nm source function	6306	i2b (4)	8
i_Surface_temp	Surface temperature	6314	i2b (4)	8
i_Surface_pres	Surface pressure	6322	i2b (4)	8
i_Surface_relh	Surface relative humidity	6330	i2b (4)	8
i_Surface_wind	Surface wind speed	6338	i2b (4)	8

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_Surface_wdir	Surface wind direction azimuth from north	6346	i2b (4)	8
i_PBL_Layer_ht	PBL Layer Height from Met Data	6354	i2b (4)	8
i_Spec_Humid	Specific Humidity	6362	i2b (4)	8
i_Temp2mAbvGrnd	Temperature 2m Above Ground Level	6370	i2b (4)	8
i_Total_CloudCov	Total Cloud Cover	6378	i2b (4)	8
i_blow_snow_ht	Blowing snow height	6386	i2b (20)	40
i_blow_snow_od	Blowing snow optical depth	6426	i2b (20)	40
i_blow_snow_erd	Blowing snow range delay	6466	i2b (20)	40
i_blow_snow_conf	Blowing snow confidence	6506	i1b (20)	20
i_atm_char_flag	Atmosphere Characterization Flag	6526	i2b (4)	8
i_atm_char_conf	Atmosphere Characterization Flag Confidence	6534	i2b (4)	8
i_spare4	Spares	6542	i1b (402)	402

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