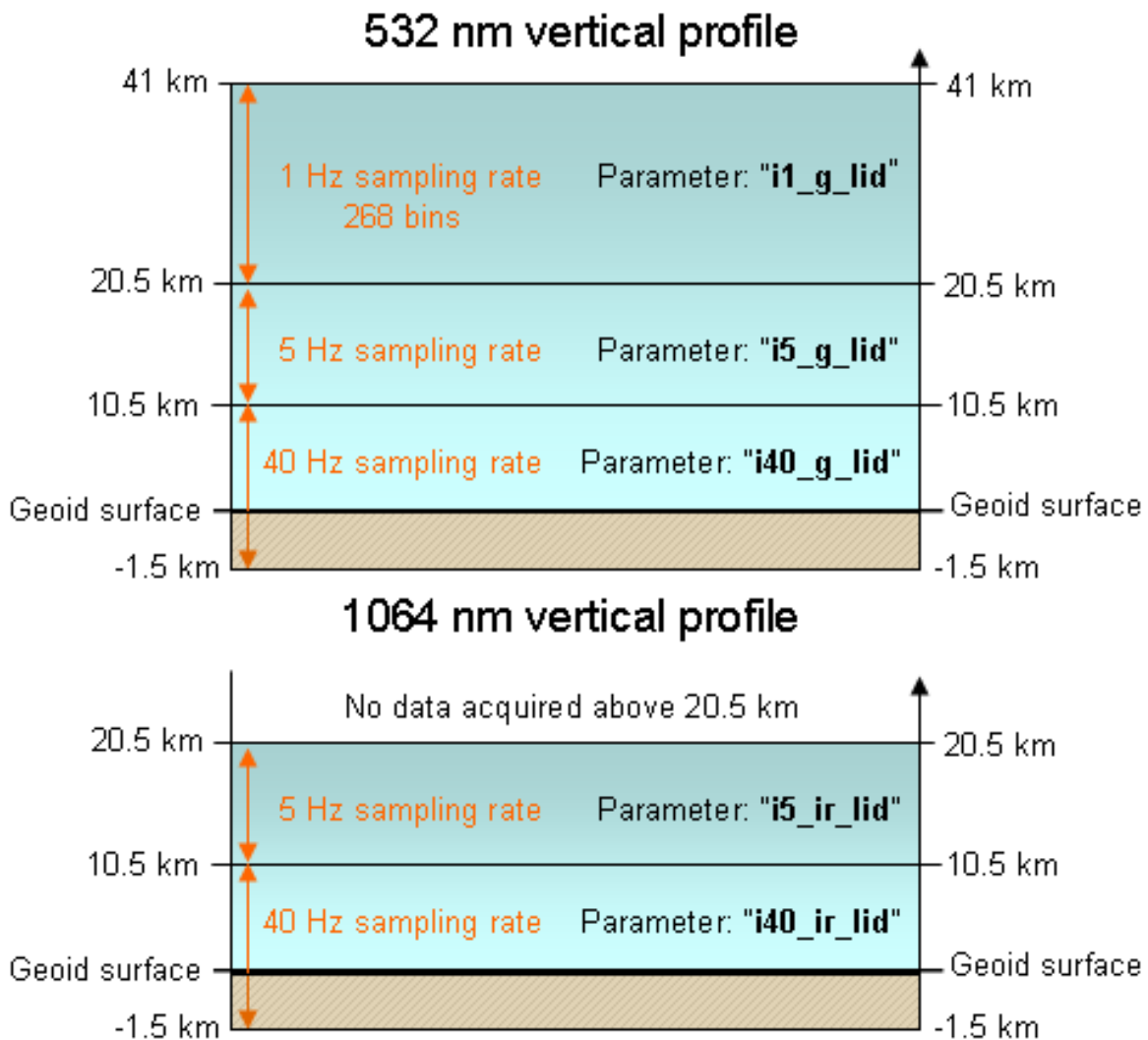


GLA02 Records: Release 33

Level-1A atmospheric data (GLA02) include the normalized relative backscatter for the 532 nm and 1064 nm channels, and low-level instrument corrections such as laser energy normalization for both channels, background subtraction, range-square correction, dead-time correction for 532 nm, photon coincidence for 532 nm, and detector-gain correction for 1064 nm. Vertical profiles for both channels are shown in the following diagrams:



The vertical resolution, calculated from each return bin's width, is 76.8 m. GLA02 consists of 1 sec records with the time and position information corresponding to the first shot (of 40) of that second. Linear interpolation between seconds should be used to obtain location and time information for each of the 40 Hz profiles within a second.

Note that the height of the top bin within each layer is not constant. The height above the ellipsoid at which GLAS acquires lidar data depends on the height of the local topography below the nadir

point of the satellite. GLAS is designed to acquire lidar data such that the end of the profile, or the last bin of the lowest layer, is always roughly 1.5 km below the geoid. Keeping this profile over changing topography causes the height of the top bin, and all subsequent bins of the profile, to change too. This "vertical shifting" only occurs on second boundaries. Within a second, all 40 shots are acquired starting at the same height. To determine the height of the top bin, examine the "i_Rng2PCProf" variable (byte offset 28476) for the 532 nm channel and "i_rng2CDProf" variable (byte offset 29500) for the 1064 nm channel. Subtracting these values from the height of the spacecraft, "i_Hsat" (byte offset 56636) yields the height above the geoid for the top bin.

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
i1_pred_lat	Predicted geodetic latitude of the laser footprint	12	i4b	4

Name	Short Description	Byte Offset	Data Type	Total Bytes
i1_pred_lon	Predicted geodetic longitude of the laser footprint	16	i4b	4
i_DEMmin	DEM minimum	20	i2b	2
i_DEMmax	DEM maximum	22	i2b	2
i_g_lid_qf	532 nm lidar data quality flag	24	i1b(12), unsigned	12
i40_g_lid	532 nm lidar data for 10.5 to -1.5 km segment	36	i4b(148,40)	23680
i5_g_lid	532 nm lidar data for 20.5 to 10.5 km segment	23716	i4b(132,5)	2640
i1_g_lid	532 nm lidar data for 40 to 20.5 km segment	26356	i4b(268)	1072
i40_g_sat_f	532 nm saturation flag for 10.5 to -1.5 km segment	27428	i1b(740), unsigned	740
i5_g_sat_f	532 nm saturation flag for 20.5 to 10.5 km segment	28168	i1b(84), unsigned	84
i1_g_sat_f	532 nm saturation flag for 40 to 20.5 km segment	28252	i1b(36), unsigned	36
i40_g_TxNrg_EU	532 nm laser transmit energy at 40 Hz	28288	i4b(40)	160
i5_g_TxNrg_EU	532 laser transmit energy at 5 Hz	28448	i4b(5)	20
i1_g_TxNrg_EU	532 laser transmit energy at 1 Hz	28468	i4b(4)	16
i_g_IntRet	532 nm integrated return, 40 km to 20.5 km	28472	i4b	4
i_Rng2PCProf	Start range of 532 nm backscatter profile	28476	i4b	4
i_Rng_PkRt	Range from spacecraft to peak of return	28480	i4b	4
i40_g_bg	532 nm background at 40 Hz	28484	i4b(4,40)	640
i5_g_bg	532 nm background at 5 Hz	29124	i4b(4,5)	80
i1_g_bg	532 nm background at 1 Hz	29204	i4b(4)	16
i_gPredCldTop	532 nm predicted cloud top height at 5 Hz	29220	i2b(5)	10
i_g_shot_ctr	532 nm lidar data shot counter	29230	i2b	2
i_SpcmBg2Del	SPCM background 2 delay	29232	i2b, unsigned	2

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_SpcmRngDel	SPCM range delay	29234	i2b, unsigned	2
i_SpcmGateDel	SPCM gate delay	29236	i2b, unsigned	2
i_SpcmBg1Del	SPCM background 1 delay	29238	i2b, unsigned	2
i_spcm_stat	SPCM status	29240	i2b, unsigned	2
i_g_TxNrg_Cts	532 nm laser transmit energy, counts	29242	i1b(40), unsigned	40
i_g_TxNrg_qf	532 nm laser transmit energy quality flag	29282	i1b(10), unsigned	10
i_g_IntRet_qf	Integrated return quality flag	29292	i1b, unsigned	1
i_spare2	Spares	29293	i1b, unsigned	1
i_ir_lid_qf	1064 nm lidar data quality flag	29294	i1b(12), unsigned	12
i_ir_shot_ctr	1064 nm cloud digitizer shot counter	29306	i2b	2
i_spcm_cts	SPCM raw counts	29308	i1b(8), unsigned	8
i_pc_rbias	Photon counter range bias	29316	i4b	4
i40_ir_TxNrgEU	1064 nm laser transmit energy at 40 Hz	29320	i4b(40)	160
i5_ir_TxNrgEU	1064 nm laser transmit energy at 5 Hz	29480	i4b(5)	20
i_rng2CDProf	Start range of the 1064 nm backscatter profile	29500	i4b	4
i40_ir_bg	1064 nm background at 40 Hz	29504	i4b(4,40)	640
i5_ir_bg	1064 nm background at 5 Hz	30144	i4b(4,5)	80
i40_ir_lid	1064 nm lidar data from 10.5 km to -1.5 km	30224	i4b(148,40)	23680
i5_ir_lid	1064 nm LIDAR data from 20.5 km to 10.5 km	53904	i4b(132,5)	2640
i_CdBg2_Del	Cloud digitizer background 2 delay	56544	i2b, unsigned	2
i_RngGate_Del	Cloud digitizer range gate delay	56546	i2b, unsigned	2

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_cd_bg1_del	Cloud digitizer background 1 delay	56548	i2b, unsigned	2
i_cd_det_stat	Cloud digitizer detector status	56550	i2b, unsigned	2
i_cd_rbias	Cloud digitizer range bias	56552	i4b	4
i_cd_ad_out	A/D output	56556	i1b, unsigned	1
i_cd_att_set	Attenuation setting	56557	i1b, unsigned	1
i_CldPkSig	Cloud return peak signal	56558	i1b(5)	5
i_gndret_pksig	Ground return peak signal	56563	i1b(5)	5
i_gnd_ret_loc	Ground return location	56568	i1b(5)	5
i_et_cal_mode	Etalon calibration - current mode	56573	i1b	1
i_ir_TxNrg_qf	1064 nm laser transmit energy quality flag	56574	i1b(10)	10
i_EtHtrC37j_c	Etalon heater current, Ch 37j	56584	i2b	2
i_EtC37d_t	Etalon temperature, Ch 37d	56586	i2b	2
i_ETsettleTime	Etalon temperature settle time	56588	i2b, unsigned	2
i_et_Flags	Etalon flags	56590	i1b, unsigned	1
i_et_update_ctr	Etalon averaging update counter	56591	i1b	1
i_et_StartTemp	Start temperature	56592	i1b	1
i_et_StopTemp	Stop temperature	56593	i1b	1
i_et_TempStep	Temperature step	56594	i1b	1
i_et_spare	Spares	56595	i1b(3), unsigned	3
i_et_acqavg_tm	Etalon averaging time for acquire command	56598	i1b	1
i_spare6	Spares	56599	i1b, unsigned	1
i_et_temperr	Etalon temperature error	56600	i4b	4
i_ET_state	Etalon state	56604	i1b	1
i_spare3	Spares	56605	i1b, unsigned	1

Name	Short Description	Byte Offset	Data Type	Total Bytes
i_et_acqset_tm	Etalon temperature settle time for acquire command	56606	12b, unsigned	2
i_et_onax_xmit	Etalon averaged on-axis transmission	56608	i4b	4
i_et_offax_xmit	Etalon averaged off-axis transmission	56612	i4b	4
i_et_trkfltout	Etalon tracking loop filter output	56616	i4b	4
i_et_trkfltavg	Etalon tracking failure average	56620	i4b	4
i_APID_AvFlg	APID Data Availability Flag	56624	i1b	8
i_OrbFlg	Orbit flag	56632	i2b, unsigned	2
i_HoffMin	Offset to minimum DEM height	56634	i2b	2
i_Hsat	Geodetic altitude of satellite above Earth	56636	i4b	4
i_4nsBgMean	4 ns background mean value	56640	i4b(40)	160
i_4nsBgSDev	4 ns background standard deviation	56800	i4b(40)	160
i_DualPinA	Dual Pin A data	56960	i1b(40), unsigned	40
i_DualPinB	Dual Pin B data	57000	i4b(40), unsigned	40
i_spare4	Spares	57040	i1b, unsigned	1
i_DitheringEnabledFlag	Dithering enabled flag	57041	i1b	1
i_timecorflg	Time-correction flag	57042	i2b	2
spare5	Spares	57044	i1b(12)	12

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