

# GSAS v3.5 Release Notes

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## Introduction

GSAS 3.5 is a semi-major release which contains fixes and adds significant functionality for L1A, Atmosphere, Waveform, and Elevation processes and products. Additionally, NOSE functionality was incorporated into GLAS\_Meta.

For L1A, the following changes were made:

- A check provided by the instrument team was insufficient to filter base GLA04 IST COIs. We revised the check to compare the absolute value of the COI to a pre-defined limit. (GLA04-04)
- We fixed significant problems with the GLA04 IST and LRS flags (`i_ist_flag`, `i_lrs_flag`). The flags were not initialized correctly, causing bad values to be written to the product. (GLA04-04)
- Code was added to `L_Alt` to compute the differences between the 40 `fire_ack` and `fire_cmd` times. A new flag was added to GLA01 which indicates that this difference is out of limits. This is a product change on GLA01 and is described later in more detail. (GLA01)
- GLA04 QAP files are now generated. (GLA04)
- `GLAS_L0proc` now uses the EDOS construction record to detect (and avoid) EDOS-filled packets. (GLA01-GLA04)
- Waveform scale factors have been put in the GLA01 header records. (GLA01)
- Changed the background subtraction level for the droop correction routine from 54.0 to 54.4, based on offline testing of the droop correction routine. (GLA02)

For Waveforms and Elevation, the following changes were made:

- The threshold level to decide where the signal region was in the waveform was raised from 4.5 to 8.0 times the standard deviation of the noise. This edited out most of the noise-only signals that were present in previous releases.
- The minimum Gaussian sigma allowed for the received waveform was raised from 0.5 ns to 2.5 ns. Gaussians fit to the transmit pulse varied slightly over the measurements, but the minimum value was 2.5 ns. Therefore physically we could not get a received signal that was narrower. This change stopped some of the problems seen fitting forward scattering type waveforms where the first Gaussian was very narrow and did not fit to the full ground return, so the second Gaussian spread out fitting to the forward scattering portion and some of the ground return. This caused the elevation measured using the max peak to be too high. (GLA05)
- Corrected `W_Assess_mod` to not calculate the elevation if there is no signal.
- Range Offset was added to GLA12-15. (GLA12-15)

- Fixed implementation of attflg, elvuseflg, altfrmflg, orbflg and corrstatflg. (GLA05, GLA06, GLA12-15)

For Atmosphere, the following changes were made:

- GD\_TIME\_TOL (in file anc07\_001\_01\_0002.dat) was changed from 1.0d0 to 1.0d2 in order to resolve problems running GLAS\_Atmos which is very sensitive to the ANC36 granule boundary times. (GLA07-11)
- Changes were made to the routines that find cloud layer heights using the 1064 (cloud digitizer) channel data. Prior version had a bug where the bottom of the layer was not defined. This is fixed. Also, modified algorithms to reduce the number of false positives. (GLA07-11)
- A bug was fixed in AtmMgr\_mod.f90 which caused errors when run in DEBUG mode. Subsequent analysis and testing of code revealed that the calculated value of the variable "i\_buff\_limit" was becoming too large. (GLA07-11)

Other, more general fixes include:

- Re-fixed problem where all ANC files did not show up in the product headers. (Affects all product headers)
- Implemented NOSE support into GLAS\_Meta. This requires that GLAS\_Meta read the data from the product files, but is quick enough that it shouldn't be a burden on operations. Fixed minor metadata issues. (Affects all product headers and .MET files)

## Product Format Change Summary

On GLA01, a new 5-byte flag (i\_TxFlg) was added. Bytes were taken from spares so the product size did not change.

On GLA06, 12-15 : replaced i\_SigBegOff with i\_isRngOff in GLA12: i\_siRngOff in GLA13: i\_ldRngOff in GLA14: i\_ocRngOff in GLA15: propagated from GLA06.

The latest product formats/descriptions will be available at [http://glas.wff.nasa.gov/v35\\_products/](http://glas.wff.nasa.gov/v35_products/).

## Release Information

The ClearCase label for this release is RELEASE\_3.5.

The release date is May 16, 2003.

Version numbers have been updated to "V3.5 May 2003" for the following:

- lib11a
- libprod
- libanc
- libplatform
- libexec

- libwf
- GLAS\_L0proc
- GLAS\_L1A
- GLAS\_Meta
- anc07\_00
- anc07\_01
- anc07\_02
- anc07\_04
- anc07\_05

This should be verified during operation by checking the version information in the appropriate ANC06 files.

## SMDS Impact

The distribution tarfile is on [glasdev.wff.nasa.gov](http://glasdev.wff.nasa.gov) at the following location:

`/glasdev1/v3/dist/gsas_v3.5.tar.z.`

### ANC Files

New versions of the ANC07\_00, ANC07\_01, ANC07\_02, ANC07\_04, and and ANC07\_05 data files are required. New version of the ANC45 files are required.

### Construction Records

Construction records should be input to GLAS\_L0proc. Construction records should be renamed exactly as the GLA00 files, except using "ANC47" instead of "GLA00" as the fileid.

For example : GLA00\_003\_20030328\_120000\_01\_0013.DAT and  
ANC47\_003\_20030328\_120000\_01\_0013.DAT

I haven't a clue how to verify that the construction record which matches a particular APID is the one which was specified in the control file. The ANC47s are used to throw away data. GLAS\_L0proc has to trust the control file. If we get inputs of ANC47s which really don't correspond to the input versions of GLA00s we will be in trouble!!!

### GLA04 QAP.

GLA04 qap files should be outputs in GLAS\_L1A.

### Version information on the INPUT\_FILE/OUTPUT\_FILE specifications

ALL GLAS\_L0proc/GLAS\_L1A/GLAS\_Atm/GLAS\_Alt GLA PRODUCT  
INPUT\_FILE and OUTPUT\_FILE control lines should follow what is defined in the GSAS User Guide.

INPUT\_FILE=file\_name<sp>start\_time<sp>stop\_time<sp>gran\_rel\_num<sp>gran\_ver\_num<sp>gran\_segment

```
OUTPUT_FILE=file_name<sp>start_time<sp>stop_time<sp>gran_rel_num<sp>
gran_ver_num<sp>gran_segment
```

See Page 5-4 of the GSAS User Guide for more information.

## PASSID

Passid Lines are now critical for all control files including GLAS\_Meta.

All libraries and binaries should be recompiled using the top-level Makefile.

**IMPORTANT: due to internal changes in the makefiles, SDMS MUST use the command "make runtime" to ensure the software is made without debug flags.**

The process for making the libraries and binaries is as follows (**NOTE: SDMS ONLY!!**)

```
cd /install_dir/gsas_v3.5
make runtime
make install
```

**Note the developers should not use the above procedure. This procedure is for SDMS only!**

## Detailed Change Notes

### **CR0000374 : Change Max number of peaks and interval between peaks for other the land**

The two changes are as follows:

```
# Max number of peaks to fit - other than land parameters
#
I_MAXFIT2 = 2
#
```

used to be set to 6; forces no more than 2 Gaussians to be fit for the standard parameterization

```
# Min interval between peaks
#
D_INTV_MIN2 = 20.0d0
#
```

used to be 5.0 forces minimum Gaussian spacing to be 20ns (between centers of peaks)

### **CR0000406 : anc07--004 change to wf parameterization**

Make the following changes in anc07\_001\_01\_0004.dat : maxfit2=2; cmb2=1; nsig2=8.0; sigmaminit=2.5; int\_min2=20.0.

### **PR0000404 : IST ( GLA04-04 ) Bad data flagging**

UTCSR has found that some IST data that GSAS has aligned is bad. They eliminate this when they edit by COI > 0.105. They also report some data from PRAP has not made it to GLA04. However it appears from the UTCSR emails (see additional information) that they should have. Investigation is required to see if there is a code improvement needed or if the results are proper and need to be documented.

Two different problems were found and fixed:

- 1) The test for the bad COI defined in the previous Mantis entry was insufficient. The ABS(limit) should be tested.
- 2) The IST and LRS flags were not initialized correctly.

**CR0000400 : change anc07...004 parameters for wf standard tuning**

From rel 10, the changes are: int\_min2=30.0; nsig2=8.0; sigmaminit=2.5; cmb2=0.0

**PR0000397 : Product headers only use information from ANC4501.**

The product headers are currently using only information for ANC4501. This caused a problem when testing for NOSE implementation.

**PR0000389 : ANC20 not processed because longitude tolerance exceeded**

The ANC20 files for May 21-24 were not being processed because a matching track could not be found in the 8 day reference orbit file. There was a maneuver inserted in the ANC20 file which caused the displacement of more than 0.015 degs longitude. The code was fixed in the ops baseline by increasing the tolerance to 0.03 degs. Another error was introduced by this maneuver which caused the cycle to be incorrectly calculated.

**PR0000386 : GLA05 elevation needs to be set invalid when no signal for standard parameterization**

Currently when there is no signal the elevation for GLA05 is calculated using the reference range and when there is a signal it is calculated using the location to the end of signal. This needs to be changed so that if there is no signal using the standard parameterization then the elevation on GLA05 is set to invalid. However the orbit and attitude should still be calculated. Make sure that if the standard parameterization gives no signal but the alternate finds a signal that GLA14 has a valid elevation and location.

Corrected W\_Assess\_mod to not calculate the elevation if there is no signal. GLA05%d\_PADPoint is still obtained from gd\_lasICRF in WFMgr if there is an anc09. GLA05%d\_PODFixedPos is set invalid if the waveform is invalid, or if there is no transmitted pulse, or if the reference range is invalid, or if there is no signal (both std & alt). The standard parameterization is used for the preliminary range offset unless there is no signal (std). In that case, the alternate parameterization is used. GLA05%i\_elvFlg indicates which was used.

**CR0000383 : GLA09 cloud heights from 1064 cloud digitizer data**

The algorithms for cloud detection using the 1064 cloud digitizer channel must be refined. Changes made for V3.5 greatly increased accuracy and reliability of cloud heights. Further changes may be necessary.

**CR0000379 : anc07 constant GD\_TIME\_TOL must be changed**

The constant GD\_TIME\_TOL must be changed from 1.0d0 to 1.0d2 to avoid time gap problems in anc36 files.

### **CR0000378 : transmit pulse problem**

Sometimes the transmit pulse is not telemetered in the transmit pulse location, but a different pulse and the time is then totally wrong causing the measurement to be off by meters to 10s of kilometers. To edit out this data, we need to check the difference between the fire ack - fire command time ( see below) and then mark the data as invalid.

Difference these (fire ack - fire command) and if it is less than 195 usecs or greater than 205 usecs, then whatever is in the transmit pulse window is NOT a transmit pulse. If it is greater thn 205 you will like see tiny blips or just noise. If it is less than 195, you will either see noise or a giant weird pulse, it is either the delay line or just the detector response to the gain changing to prepare for the return pulse. Either way, it is NOT the start pulse.

On GLA01 at the end of the main record is i\_spare2. There needs to be a new i\_TxFlag of 40 bits ( 5 bytes ) and i\_spare\_2 reduced to 15 bytes so total record length is not changed. The new i\_TxFlag is set to invalid for either of the above cases, otherwise it is set to valid.

### **PR0000372 : saturation flag needs to be set based on new criteria .**

The saturation flag in wfqual needs to be set based on new criteria defined by Xiaoli. Currently it is set based on the counts being  $\geq 230.0$

New algorithm:

(Gain= 13) AND (pulse amplitude exceed 220)AND (Echo pulse energy  $> (15fJ)$  ).

### **PR0000366 : Problems reading ANC36 file. .**

Several SDMS jobs failed with the following error:

```
48291460 STATUS= 10005, 0, OpenFInFile, Opened file: (Input)
ANC36_009_11_02002_0027_0_01_0001.DAT
```

```
48291460 ERROR=-10008, 3, read_atm_cc, Error Reading File: Error reading atm cal
cof data
```

### **CR0000342 : GLA13 does not have sea ice range offset**

The problem in this bug has been combined with mantis entry 0000340 .

### **CR0000340 : GLA12, GLA13, GLA14, and GLA15 do not contain the range offset used to calculate the elevation on the product.**

The elevation is calculated on GLA12, GLA13, GLA14, and GLA15 using the ice sheet, sea ice, land, and ocean range offsets respectfully. However the corresponding range offset is not present on the product so cannot recalculate the elevation using a different offset. On each of these products, we need to replace the i\_sigbegoff with the appropriate range offset.

on GLA12 replace i\_sigbegoff with i\_isrngoff

on GLA13 replace i\_sigbegoff with i\_isrngoff

on GLA14 replace i\_sigbegoff with i\_ldrngoff

on GLA15 replace i\_sigbegoff with i\_ocrngoff

Change the corresponding product variables and request changes in the parameter data base defining the product

In elevmgr these 4 offsets are defined and placed in GLA06 variables. Use the GLA06 variable name when you define them,

i.e. GLA12%d\_isrngoff=GLA06\_isrngoff etc.

### **AI0000339 : Move W\_Add2Hst\_mod.f90 to common**

W\_Add2Hst\_mod.f90 is used by qapg and should also be used by the elevation code to compute histogram bins.

It is located in src/waveforms/W\_Common.

It should be moved to src/common\_libs, possibly in math\_lib.

### **AI0000337 : Enable GL0P to parse the PDS/EDS Construction Record**

This code breaks every rule we have. It is mostly written in C, given that the structure of the construction records cannot be coded efficiently in Fortran. It also allocates memory in both Fortran and C and reads the entire construction record into core..

SDMS should now provide ANC47 files as inputs to GLAS\_L0proc. ANC47 files should be named exactly as GLA00 files, with "ANC47" replacing "GLA00". Failure to provide a construction record as input will elicit a sanity check warning. Not much can be done to determine if the correct version of the construction record is provided with the correct version of the APID.

### **PR0000323 : Some GLA06, 12-15 Flags Are Incorrect**

All discernable problems with these flags were resolved on branches pr323 and wpr323, involving modules for ElevMgr\_mod, WFMgr\_mod, anc08\_mod, and anc09\_mod.

Some of the reported problems with anc08 and anc09 were due to partial miscommunications between the originators of the data and the local programmers utilizing the data, though these seem to have been satisfactorily resolved.

Some of the reported flag problems could not be verified. This might be because the problems did not occur in the available sample data used for analysis and testing, or possibly because documentation of the problem was insufficiently precise to locate the problem; therefore, scrutiny of all flag values should continue in future software builds.

### **PR0000291 : Using DEBUG mode, Atmosphere developers should fix code till it runs test set without errors**

Developers should test with the following dataset. The code should be tested until it runs without error.

The data are on gladev.wff.nasa.gov in /glasdev1/flight\_data/atm\_20030222.

## **CR0000150 : Place scaling factors into GLA01 header records**

Waveform raw counts needs to be converted to a floating point number based on a 0 to 255 table (anc07) lookup both in L1A and L1B. All computations on waveforms will be done on these re-scaled values. The raw will still be on the GLA01 product. The waveform lookup table needs to be in the GLA01 header record(s). Wrong track point and energy.

GLA01\_hdr\_mod significantly enhanced and modified to write the gain\_table and volt\_table's data from const\_glob into the GLA01 header as the file is created. Involves a minor addition to const\_glob module. Modifications made on branch wcr150, using much of the existing keyval software and structures. This is first mod that adds "local" header records in addition to the "common" header records found on all products. Size of header data is enhanced from 1 to 6 records with this addition. Although no provision exists for reading the noted tables of data backwards from the header into storage, the "read" software module with the GLA01\_hdr\_mod was changed to show how this process can be done.

## **AI0000134 : Move onepass\_avg\_mod.f90**

onepass\_avg\_mod.f90, which implements the Kahan algorithm for one-pass averaging, was written as part of the qap generator.

It is needed elsewhere and should be moved to the math lib archive.

## **AI0000101 : Implement Selective NOSE Metadata**

## **AI0000098 : Interfacing the NOSE Routines with GSAS**

NOSE routines were added into GLAS\_Meta. This requires that GLAS\_Meta re-read the product data, but in practice, this has been a fairly quick process.

## **AI0000094 : QAP Mod for GLA04**

QAP support has been added for GLA04.

## **Changed files**

```
./Makefile
./data/anc07_001_01_0000.dat
./data/anc07_001_01_0001.dat
./data/anc07_001_01_0002.dat
./data/anc07_001_01_0004.dat
./data/anc07_001_01_0005.dat
./data/anc45_001_01_0013.dat
./data/anc45_001_01_0014.dat
./data/anc45_001_01_0015.dat
./src/atmosphere/layers/A_1s_1064_det_mod.f90
./src/atmosphere/layers/A_20s_1064_det_mod.f90
./src/atmosphere/layers/A_4s_1064_det_mod.f90
./src/atmosphere/layers/A_lays_1064_mod.f90
./src/common_libs/Makefile
./src/common_libs/anc_lib
./src/common_libs/anc_lib/Makefile
./src/common_libs/anc_lib/anc07_glob_mod.f90
```

```
./src/common_libs/anc_lib/anc07_11a_mod.f90
./src/common_libs/anc_lib/anc08_pod_mod.f90
./src/common_libs/anc_lib/anc45_meta_mod.f90
./src/common_libs/anc_lib/anc47_pds_io.c
./src/common_libs/anc_lib/anc47_pds_mod.f90
./src/common_libs/anc_lib/anc47_pds_util.c
./src/common_libs/anc_lib/anc47_pds_util.h
./src/common_libs/anc_lib/vers_anc_mod.f90
./src/common_libs/err_lib/ErrorBoot_mod.f90
./src/common_libs/exec_lib
./src/common_libs/exec_lib/Makefile
./src/common_libs/exec_lib/c_nose_mod.f90
./src/common_libs/exec_lib/com_hdr_update_mod.f90
./src/common_libs/exec_lib/fCntl_mod.f90
./src/common_libs/exec_lib/get_fileindex_mod.f90
./src/common_libs/exec_lib/passid_mod.f90
./src/common_libs/exec_lib/vers_exec_mod.f90
./src/common_libs/math_lib
./src/common_libs/math_lib/Makefile
./src/common_libs/math_lib/onepass_avg_mod.f90
./src/common_libs/math_lib/w_add2hst_mod.f90
./src/common_libs/platform_lib/const_glob_mod.f90
./src/common_libs/platform_lib/const_11a_mod.f90
./src/common_libs/platform_lib/vers_platform_mod.f90
./src/common_libs/prod_lib
./src/common_libs/prod_lib/GLA01_alg_mod.f90
./src/common_libs/prod_lib/GLA01_hdr_mod.f90
./src/common_libs/prod_lib/GLA01_prod_mod.f90
./src/common_libs/prod_lib/GLA01_scal_mod.f90
./src/common_libs/prod_lib/GLA02_hdr_mod.f90
./src/common_libs/prod_lib/GLA03_hdr_mod.f90
./src/common_libs/prod_lib/GLA05_hdr_mod.f90
./src/common_libs/prod_lib/GLA06_Pass_mod.f90
./src/common_libs/prod_lib/GLA06_hdr_mod.f90
./src/common_libs/prod_lib/GLA07_hdr_mod.f90
./src/common_libs/prod_lib/GLA08_hdr_mod.f90
./src/common_libs/prod_lib/GLA09_hdr_mod.f90
./src/common_libs/prod_lib/GLA10_hdr_mod.f90
./src/common_libs/prod_lib/GLA12_alg_mod.f90
./src/common_libs/prod_lib/GLA12_hdr_mod.f90
./src/common_libs/prod_lib/GLA12_prod_mod.f90
./src/common_libs/prod_lib/GLA12_scal_mod.f90
./src/common_libs/prod_lib/GLA13_alg_mod.f90
./src/common_libs/prod_lib/GLA13_hdr_mod.f90
./src/common_libs/prod_lib/GLA13_prod_mod.f90
./src/common_libs/prod_lib/GLA13_scal_mod.f90
./src/common_libs/prod_lib/GLA14_alg_mod.f90
./src/common_libs/prod_lib/GLA14_hdr_mod.f90
./src/common_libs/prod_lib/GLA14_prod_mod.f90
./src/common_libs/prod_lib/GLA14_scal_mod.f90
./src/common_libs/prod_lib/GLA15_alg_mod.f90
./src/common_libs/prod_lib/GLA15_hdr_mod.f90
./src/common_libs/prod_lib/GLA15_prod_mod.f90
./src/common_libs/prod_lib/GLA15_scal_mod.f90
./src/common_libs/prod_lib/Makefile
./src/common_libs/prod_lib/common_flags_mod.f90
./src/common_libs/prod_lib/vers_prod_mod.f90
./src/createGran_util/pop_granule_mod.f90
```

```
./src/elevations/anc09_pad_mod.f90
./src/glas_alt/ElevMgr_mod.f90
./src/glas_alt/WFMgr_mod.f90
./src/glas_atm/AtmMgr_mod.f90
./src/glas_l0p/GLAS_L0proc.f90
./src/glas_l0p/GetControl_mod.f90
./src/glas_l0p/glop_mod.f90
./src/glas_ll1a/GLAS_LL1A.f90
./src/glas_ll1a/L1AMgr_mod.f90
./src/glas_meta/GLAS_Meta.f90
./src/glas_meta/WriteMetaFile_mod.f90
./src/ll1a_lib
./src/ll1a_lib/L_Alt_mod.f90
./src/ll1a_lib/L_Atm_mod.f90
./src/ll1a_lib/L_Att_mod.f90
./src/ll1a_lib/Makefile
./src/ll1a_lib/centroid_mod.f90
./src/ll1a_lib/qap04_mod.f90
./src/ll1a_lib/vers_ll1a_mod.f90
./src/prod_util/constr_rec/crview.c
./src/prod_util/scantime/scantime.f90
./src/prod_verify/code/Makefile
./src/waveforms/W_Assess/W_Assess_mod.f90
./src/waveforms/W_Assess/test/Makefile
./src/waveforms/W_CreQASStats/test/Makefile
./src/waveforms/W_FunctionalFt/test/Makefile
./src/waveforms/test/WFMgr/Makefile
./src/waveforms/test/wfProcessor/Makefile
./src/wf_lib
./src/wf_lib/Makefile
./src/wf_lib/vers_wf_mod.f90
```