

**University of Texas
Center for Space Research
ICESAT/GLAS Document:**

**CSR SCF Release Notes
for Orbit and Attitude Determination**

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Version History

Version 1.0, August 2006

Original document

Version 1.1, October 2006

Changed table column name from 1-digit “Elevation Product Y-code” to 3-digit YXX
“Elevation Product Release”

Added note about releases prior to I-SIPS Release 28

Added Release 428 row information for completed L2b, L3d

Redefined Laser 1a Release 18 to PAD level 2 (218)

Redefined Laser 2a Releases 14 and 17 to PAD level 3 (314, 317)

Version 1.2, March 2007

Corrected ANC09 release number for L3b

Added rows for L1a (228), L2a (328, 428), L2c (128), L3a (428), L3b (428), L3c (328),
L3f (128), L3g (128, 328, 428), L3h (128)

Added a note for L3g ANC08 about the transition of IGS GPS orbits from ITRF2000 to
ITRF2005.

Version 2.0, October 2009

Restructured ANC explanation text into one section.

Added tables for campaigns L3i, L3j, L3k, L2d, L2e, and L2f.

Added table rows for the new levels of several earlier campaigns, and for the current
processing of all campaigns to elevation product level 531.

Version 3.0, August 2011

Expanded, clarified and reorganized all text.

Added Table of Contents.

Added extensive details to ANC08 and ANC09 format descriptions for the 2011
reprocessing of all campaigns to elevation product level 633.

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Summary

This document contains notes for ANC04, ANC08, and ANC09 ancillary files reported by UTCSR for ICESat/GLAS elevation data product generation.

- Includes descriptions of each ANC file type for each ANC release for each campaign
- Includes elevation POD and PAD calibration level numbers used to determine the Y-code in the release naming convention for the elevation products GLA06 and GLA12-15. See also *YXX Release Number Convention* document.
- This document does contain listings for some rapid, near-real-time products, but does not list intermediate or test products developed for internal review by the POD/PAD team. Any data having a product release other than those listed here is not an officially released product and should not be used.

General Notes on Ancillary Files

ANC04: ICRF to ITRF Transformation File

The transformation between the International Celestial Reference Frame (ICRF) and the International Terrestrial Reference Frame (ITRF) depends on Earth orientation parameters provided by the International Earth Rotation Service (IERS). It is critical that the same values used in ICESat precision orbit determination (POD) are used in the geolocation algorithm. Thus, UTCSR typically provides one product with the rapid POD products, generated during the laser operations campaign, and a second one with the final POD products, generated after the completion of the campaign. ITRF 2000 was implemented from launch until 2005, and ITRF 2005 since 2005. The transition occurred in the middle of ICESat laser campaign L3g with no discernable effect. See page 17 for more details.

ANC08: Precision Orbit Determination (POD) Ephemeris File

- POD Calibration Level 1 (rapid)
- POD Calibration Level 2 (final)
- POD Calibration Level 3 (2011 reprocessing)

The differences between the ICESat rapid and final POD products are entirely related to the inputs from external sources. The most significant of these are the orbits of the GPS satellites, as determined by the International GNSS Service (IGS), which provides its own rapid and final GNSS ephemerides.

To generate the ICESat rapid POD products (*POD calibration level 1*), UTCSR uses the IGS rapid orbit solutions, along with preliminary IERS Earth orientation parameters (mentioned above), and rapid estimates of solar flux and geomagnetic indices obtained

from the National Oceanic and Atmospheric Administration (NOAA) Space Environment Center.

Unless otherwise noted in the tables below, final POD products (*POD calibration level 2*) are generated using the final IGS orbit solutions for the GPS satellites, the final IERS Earth orientation parameters, and final estimates of solar flux and geomagnetic indices provided by the National Geophysical Data Center (NGDC). Final POD includes orbits based on a mix of IGS orbit solutions using either ITRF2000 (on and before 5-Nov-2006) or ITRF2005 (on and after 6-Nov-2006).

The 2011 reprocessing POD (*POD calibration level 3*) is an updated version of final POD with a consistent set of algorithms and models for all ICESat campaigns. See pages 18-19 for more details.

ANC09: Precision Attitude Determination (PAD) File

During the course of the ICESat mission, the determination of the laser-pointing direction for each transmitted pulse has evolved significantly. As a result, however, there have been, and continue to be, multiple releases of these precision attitude determination (PAD) solutions for each campaign (comprising *PAD calibration levels 1 to 5*).

In general, during a laser campaign, UTCSR computes instrument attitude solutions using an Extended Kalman Filter (EKF) to process gyro and uncorrected instrument star-tracker (IST) data, and then applies fixed laser biases to obtain the laser pointing directions. After a campaign concludes, UTCSR applies calibration corrections to account for IST and laser motion with respect to the instrument. For different campaigns, these corrections have been based on: (1) direct observations made in the on-board Laser Reference Sensor (LRS); (2) models using limited LRS data; (3) differencing of the EKF and batch-derived attitude solutions; and (4) ocean and around-the-world scan maneuvers.

Data processed for latter campaigns were limited to the rapid solutions described above (*PAD calibration level 1*) and the fully calibrated solutions (*PAD calibration level 4*), which combine the last two corrections. The 2011 reprocessing PAD (*PAD calibration level 5*) is an updated and consistent version of final PAD for all ICESat campaigns. See pages 20-28 for more details.

Elevation Product Tables by Laser Campaign

The following tables list information for each official ICESat/GLAS data release product (rapid, final, and 2011 reprocessing). Table headings are:

- I-SIPS Product Release(s): The version(s) of the NASA SCF processing software that integrates POD and PAD with GLAS range and other information to compute the geolocation of each laser spot.
- Start and Stop Date (DOY): The calendar date and day of year that begin and end each laser-on campaign. All official ICESat data releases were processed as complete campaigns.
- UTCSR ANC04/08/09 Release/Level: The version numbers of the UTCSR POD and PAD processing software for each ANC file type.
- Elevation Product Release: Elevation product level using the YXX numbering system. Release numbers marked with an asterisk (*) were generated before the three-digit YXX definition and are not included in the data product filename or header. For these older data (before I-SIPS Release 28), only the XX part is listed in the product, which is equivalent to the number in the first column “I-SIPS Product Release(s)”. See also *YXX Release Number Convention* document.

L1 Sailboat mode (L1a)

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	20-Feb-2003 (051)	21-Mar-2003 (080)	7	15/3	76/5	633
31	20-Feb-2003 (051)	21-Mar-2003 (080)	2 (v2)	2/2	56/4	531
28, 29	20-Feb-2003 (051)	21-Mar-2003 (080)	2 (v2)	2/2	46/4	428, 429
28	20-Feb-2003 (051)	21-Mar-2003 (080)	2 (v2)	2/2	11/2	228
18	20-Feb-2003 (051)	21-Mar-2003 (080)	2 (v2)	2/2	11/2	218*
17	05-Mar-2003 (064)	21-Mar-2003 (080)	2 (v1)	2/2	8/2	217*
11-13	20-Feb-2003 (051)	21-Mar-2003 (080)	2 (v1)	2/2	2/1	111-113*
8-10	20-Feb-2003 (051)	21-Mar-2003 (080)	10 ¹	10 ¹ /1	10 ¹ /1	108-110*

¹The number 10 was incorrectly used to indicate Release 1.

L1 Airplane Mode (L1b)

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	21-Mar-2003 (080)	29-Mar-2003 (088)	7	15/3	76/5	633
31	21-Mar-2003 (080)	29-Mar-2003 (088)	2 (v2)	2/2	56/4	531
30	21-Mar-2003 (080)	29-Mar-2003 (088)	2 (v2)	2/2	56/4	530
29	21-Mar-2003 (080)	29-Mar-2003 (088)	2 (v2)	2/2	56/4	429
13	21-Mar-2003 (080)	29-Mar-2003 (088)	2 (v1)	2/1	2/1	113*
8-10	21-Mar-2003 (080)	29-Mar-2003 (088)	10 ¹	10 ¹ /1	10 ¹ /1	108-110*

¹The number 10 was incorrectly used to indicate Release 1.

Laser 2a

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	25-Sep-2003 (268)	18-Nov-2003 (322)	7	15/3	76/5	633
31	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	13/2	74/4	531
29	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	58/4	529
28	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	30/4	428
26	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	25/4	426
21, 24	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	15/3	421*,424*
19	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	13/3	319*
18	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v2)	4/2	9/3	318*
14, 17	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v1)	3/1	6/2	314*,317*
12	25-Sep-2003 (268)	18-Nov-2003 (322)	2 (v1)	3/1	2/1	112*

Laser 2b

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	17-Feb-2004 (048)	21-Mar-2004 (081)	7	15/3	76/5	633
31	17-Feb-2004 (048)	21-Mar-2004 (081)	2 (v2)	6/2	59/4	531
29	17-Feb-2004 (048)	21-Mar-2004 (081)	2 (v2)	6/2	59/4	529
26, 28	17-Feb-2004 (048)	21-Mar-2004 (081)	2 (v2)	6/2	23/4	426*,428
22	17-Feb-2004 (048)	21-Mar-2004 (081)	2 (v2)	6/2	20/3	322*
15-17	17-Feb-2004 (048)	21-Mar-2004 (081)	2 (v1)	3/1	6/1	115-117*

Laser 2c

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	18-May-2004 (139)	21-Jun-2004 (173)	7	15/3	76/5	633
31	18-May-2004 (139)	21-Jun-2004 (173)	2 (v2)	8/2	53/4	531
29	18-May-2004 (139)	21-Jun-2004 (173)	2 (v2)	8/2	53/4	429
28	18-May-2004 (139)	21-Jun-2004 (173)	2 (v2)	8/2	53/4	428
28	18-May-2004 (139)	21-Jun-2004 (173)	2 (v1)	3/1	7/1	128
17	18-May-2004 (139)	21-Jun-2004 (173)	2 (v1)	3/1	7/1	117*

Laser 3a

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	03-Oct-2004 (277)	08-Nov-2004 (313)	7	15/3	76/5	633
31	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v2)	6/2	65/4	531
30	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v2)	6/2	65/4	530
28	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v2)	6/2	19/4	428
23	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v2)	6/2	19/4	423*
22	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v2)	6/2	17/3	322*
18	03-Oct-2004 (277)	08-Nov-2004 (313)	2 (v1)	5/1	12/1	118*

Laser 3b

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	17-Feb-2005 (048)	24-Mar-2005 (083)	7	15/3	76/5	633
31	17-Feb-2005 (048)	24-Mar-2005 (083)	2 (v2)	8/2	27/4	531
28	17-Feb-2005 (048)	24-Mar-2005 (083)	2 (v2)	8/2	27/4	428
19	17-Feb-2005 (048)	24-Mar-2005 (083)	2 (v1)	5/1	16/1	119*

Laser 3c

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	20-May-2005 (140)	22-Jun-2005 (173)	7	15/3	76/5	633
31	20-May-2005 (140)	22-Jun-2005 (173)	2 (v2)	8/2	35/4	531
28	20-May-2005 (140)	22-Jun-2005 (173)	2 (v2)	8/2	35/4	428
22	20-May-2005 (140)	22-Jun-2005 (173)	2 (v1)	5/1	18/1	122*

Laser 3d

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Y-code
33	21-Oct-2005 (294)	24-Nov-2005 (328)	7	15/3	76/5	633
31	21-Oct-2005 (294)	24-Nov-2005 (328)	2 (v2)	6/2	22/4	531
26, 28	21-Oct-2005 (294)	24-Nov-2005 (328)	2 (v2)	6/2	22/4	426*,428
25	21-Oct-2005 (294)	24-Nov-2005 (328)	2 (v1)	5/1	21/1	125*

Laser 3e

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	22-Feb-2006 (053)	28-Mar-2006 (087)	7	15/3	76/5	633
31	22-Feb-2006 (053)	28-Mar-2006 (087)	2 (v2)	8/2	27/4	531
27, 28	22-Feb-2006 (053)	28-Mar-2006 (087)	2 (v2)	8/2	27/4	427*,428
26	22-Feb-2006 (053)	28-Mar-2006 (087)	2 (v1)	5/1	24/1	126*

Laser 3f

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	24-May-2006 (144)	26-Jun-2006 (177)	7	15/3	76/5	633
31	24-May-2006 (144)	26-Jun-2006 (177)	2 (v2)	8/2	41/4	531
28	24-May-2006 (144)	26-Jun-2006 (177)	2 (v2)	8/2	38/4	428
28	24-May-2006 (144)	26-Jun-2006 (177)	2 (v1)	7/1	26/1	128
26	24-May-2006 (144)	26-Jun-2006 (177)	2 (v1)	7/1	26/1	126*

Laser 3g

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	25-Oct-2006 (298)	28-Nov-2006 (332)	7	15/3	76/5	633
31	25-Oct-2006 (298)	28-Nov-2006 (332)	2 (v2)	11/2	33/4	531
28	25-Oct-2006 (298)	28-Nov-2006 (332)	2 (v2)	11/2	33/4	428
28	25-Oct-2006 (298)	28-Nov-2006 (332)	2 (v1)	9/1	29/1	128

Laser 3h

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	12-Mar-2007 (071)	14-Apr-2007 (104)	7	15/3	76/5	633
31	12-Mar-2007 (071)	14-Apr-2007 (104)	2 (v2)	/2	40/4	531
29	12-Mar-2007 (071)	14-Apr-2007 (104)	2 (v2)	/2	40/4	429
28	12-Mar-2007 (071)	14-Apr-2007 (104)	2 (v2)	/2	39/4	428
28	12-Mar-2007 (071)	14-Apr-2007 (104)	2 (v1)	9/1	34/1	128

Laser 3i

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	2-Dec-2007 (275)	5-Nov-2007 (309)	7	15/3	76/5	633
31	2-Dec-2007 (275)	5-Nov-2007 (309)	2 (v2)	13/2	50/4	531
29	2-Dec-2007 (275)	5-Nov-2007 (309)	2 (v2)	13/2	50/4	429
28	2-Dec-2007 (275)	5-Nov-2007 (309)	2 (v2)	13/2	50/4	428
28	2-Dec-2007 (275)	5-Nov-2007 (309)	2 (v1)	12/1	45/1	128

Laser 3j

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	17-Feb-2008 (048)	21-Mar-2008 (081)	7	15/3	76/5	633
31	17-Feb-2008 (048)	21-Mar-2008 (081)	2 (v2)	13/2	55/4	531
29	17-Feb-2008 (048)	21-Mar-2008 (081)	2 (v2)	13/2	55/4	429
28	17-Feb-2008 (048)	21-Mar-2008 (081)	2 (v2)	13/2	55/4	428
28	17-Feb-2008 (048)	21-Mar-2008 (081)	2 (v1)	12/1	51/1	128

Laser 3k

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	4-Oct-2008 (282)	19-Oct-2008 (293)	7	15/3	76/5	633
31	4-Oct-2008 (282)	19-Oct-2008 (293)	2 (v2)	13/2	62/4	531
29	4-Oct-2008 (282)	19-Oct-2008 (293)	2 (v1)	12/1	57/1	129

Laser 2d

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	25-Nov-2008 (330)	17-Dec-2008 (352)	7	15/3	76/5	633
31	25-Nov-2008 (330)	17-Dec-2008 (352)	2 (v2)	13/2	66/4	531
30	25-Nov-2008 (330)	17-Dec-2008 (352)	2 (v2)	13/2	66/4	530
29	25-Nov-2008 (330)	17-Dec-2008 (352)	2 (v1)	12/1	60/1	129

Laser 2e

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	9-Mar-2009 (068)	11-Apr-2009 (101)	7	15/3	76/5	633
31	9-Mar-2009 (068)	11-Apr-2009 (101)	2 (v2)	13/2	70/4	531
30	9-Mar-2009 (068)	11-Apr-2009 (101)	2 (v1)	12/1	63/1	130

Laser 2f

I-SIPS Product Release(s)	Start Date (DOY)	Stop Date (DOY)	UTCSR ANC04 Release	UTCSR ANC08 Release/ Level	UTCSR ANC09 Release/ Level	Elevation Product Release
33	30-Sep-2009 (273)	11-Oct-2009 (284)	7	15/3	76/5	633
31	30-Sep-2009 (273)	11-Oct-2009 (284)	2 (v2)	13/4	72/4	531
31	30-Sep-2009 (273)	11-Oct-2009 (284)	2 (v1)	12/1	69/1	131

Ancillary Product Descriptions

ANC04

ANC04 Release 7

- Generated during 2011 reprocessing
- Release incremented to account for hardware and software changes

ANC04 Release 2 (v2)

- Generated during final POD solutions
- Maintained release number, but incremented version to 2

ANC04 Release 2 (v1)

- Generated during rapid POD solutions
- Added RELEASE keyword to standard header
- Added USEBEG and USEEND keywords to file-specific header

ANC04 Release 2

- Generated during final POD solutions
- Added RELEASE keyword to standard header
- Added USEBEG and USEEND keywords to file-specific header

ANC04 Release 10

- Generated during rapid POD solutions
- The number 10 was incorrectly used to label products that were actually Release 1

ANC08

ANC08 Release 15 (*POD calibration level 3*)

- Generated during 2011 reprocessing
- UTCSR MSODP software version changed from 2003.1 to 2009.1
- Reference Frame
 - IGS GPS ephemeris product changed from IGS final product to IGS repro1 (L1a to L3i)
 - Ground station network updated (42 common, 10 removed, 3 added)
 - Ground station locations updated from IGS00 to IGS05 (L1a to L3f) and from ITRF2005 to IGS05 (L3g to L2f)
 - EOPDAT changed from EOPDAT_C to EOPDAT_C_05 (L1a to L3h)
- Dynamic Model
 - Gravity Model updated from GGM01C (100x100) to GGM03C (100x100)
 - Solid Earth Tide Model updated from IERS 1996 to IERS 2003
 - Ocean Tide Model changed to FES2004
- Observation Model
 - Ground antenna phase center offset model updated from igs_01.pcv to igs05.atx
 - Included GPS transmitter antenna phase center variation model in igs05.atx
 - Updated GPS yaw table
- Estimation Parameters
 - Added estimation of cross-track direction center of mass offset

ANC08 Release 9 (*POD calibration level 2*)

- Final POD solutions
- Corrected geomagnetic computation for low solar-flux periods
- (L1a to L3g) ITRF 2000 IGS GPS solutions
- (L3g to L2f) ITRF 2005 IGS GPS solutions
- ITRF note for L3g: On 6-Nov-2006, the reference frame of the IGS GPS orbits was changed from ITRF2000 to ITRF2005. Accordingly, the rapid POD (Release 128) and final POD (Release 428) of L3g uses ITRF2000 GPS orbits from 25-Oct to 5-Nov and ITRF2005 GPS orbits from 6-Nov to 28-Nov. A single ground station position solution from ITRF2005 was used over the entire time span. Tests indicate that orbit position differences caused by the IGS reference frame switch are at the sub-mm level.

ANC08 Release 9 (*POD calibration level 1*)

- Rapid POD solutions
- Corrected geomagnetic computation for low solar-flux periods
- (L1a to L3f) ITRF 2000 IGS GPS solutions
- (L3g and subsequent campaigns) ITRF 2005 IGS GPS solutions

ANC08 Release 8 (*POD calibration level 2*)

- Final POD solutions

- Corrected geomagnetic computation for low solar-flux periods

ANC08 Release 6 (*POD calibration level 2*)

- Final POD solutions
- Changed zenith delay parameter estimation strategy for short passes
- (L3d) Used preliminary solar flux and geomagnetic index data

ANC08 Release 5 (*POD calibration level 1*)

- Rapid POD solutions
- Changed zenith delay parameter estimation strategy for short passes

ANC08 Release 4 (*POD calibration level 2*)

- Final POD solutions
- Changed gravity field from GRACE31 to GGM01C

ANC08 Release 3 (*POD calibration level 1*)

- Rapid POD solutions
- Changed gravity field from GRACE31 to GGM01C

ANC08 Release 2 (*POD calibration level 2*)

- Final POD solutions
- Added RELEASE keyword to standard header

ANC08 Release 10 (*POD calibration level 1*)

- Rapid POD solutions
- The number 10 was incorrectly used to label products that were actually Release 1

ANC09

ANC09 Release 76 (PAD calibration level 5)

- Generated during 2011 reprocessing
- Applied new scan-maneuver calibrations to ANC09 Release 75

ANC09 Release 75 (PAD calibration level 3)

- Used updated star catalogs
- Applied new de-distortion map to IST data
- Used updated bad star list
- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 74 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 73
- Only for day 323 of year 2003

ANC09 Release 73 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values
- Only for day 323 of year 2003

ANC09 Release 72 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 71

ANC09 Release 71 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases

ANC09 Release 70 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 67

ANC09 Release 69 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 67 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases

ANC09 Release 66 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 64

ANC09 Release 65 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 17

ANC09 Release 64 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases

ANC09 Release 63 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 62 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 61

ANC09 Release 61 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 60 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 59 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 20

ANC09 Release 58 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 28

ANC09 Release 57 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 56 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 44

ANC09 Release 55 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 54

ANC09 Release 54 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 53 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 52

ANC09 Release 52 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Replaced EKF solution with Batch method solution during IST sun blinding events
- Corrected 0.1 second IST time tag jumps associated with sun blinding
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 51 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 50 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 47

ANC09 Release 49 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 47

ANC09 Release 48 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 44

ANC09 Release 47 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 46 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 42 (L1a) and ANC09 Release 44(L1b)

ANC09 Release 45 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 44 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 42 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 41 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 37

ANC09 Release 40 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 39

ANC09 Release 39 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 38 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 37

ANC09 Release 37 (PAD calibration level 3)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Replaced EKF solution with Batch method solution during IST sun blinding events
- Corrected 0.1 second IST time tag jumps associated with sun blinding
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 36 (PAD calibration level 4)

- Applied new scan-maneuver calibrations to ANC09 Release 32

ANC09 Release 35 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 32

ANC09 Release 34 (*PAD calibration level 1*)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 33 (PAD calibration level 4)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 32 (*PAD calibration level 3*)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Replaced IST solution with BST solution during IST sun blinding events
- Corrected 0.1 second IST time tag jumps associated with sun blinding
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 31 (*PAD calibration level 3*)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument

- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 30 (PAD calibration level 4)

- Applied scan-maneuver calibrations to ANC09 Release 28

ANC09 Release 29 (PAD calibration level 1)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 28 (*PAD calibration level 3*)

- Step required to re-compute LRS-corrected attitude, using arctangent-corrected GLA04 IST data
- Applied ANC09 Release 13 laser biases

ANC09 Release 27 (PAD calibration level 4)

- Applied arctangent correction to GLA04 IST data
- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 26 (*PAD calibration level 1*)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 25 (*PAD calibration level 4*)

- Updated Laser Profiling Array (LPA) spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 24 (*PAD calibration level 1*)

- Applied arctangent correction to GLA04 IST data
- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 23 (*PAD calibration level 4*)

- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 22 (*PAD calibration level 4*)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases
- Updated LPA spot characteristics to reflect $1/e^2$, rather than fixed, cutoff in intensity values

ANC09 Release 21 (*PAD calibration level 1*)

- Applied arctangent correction to GLA04 IST data
- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans

ANC09 Release 20 (*PAD calibration level 3*)

- Replaced direct LRS corrections with batch-EKF corrections to compensate for IST motion with respect to the instrument
- [Correction] Applied de-distortion map (L3a Version 2.1) to IST data
- Updated and applied laser biases to pre-launch alignment

ANC09 Release 19 (*PAD calibration level 4*)

- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases

ANC09 Release 18 (*PAD calibration level 1*)

- Applied de-distortion map (L3a Version 1) to IST data
- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans

ANC09 Release 17 (*PAD calibration level 3*)

- Applied batch-EKF corrections to compensate for IST motion with respect to the instrument
- Applied de-distortion map (L3a Version 1) to IST data
- Updated and applied laser biases to pre-launch alignment

ANC09 Release 16 (*PAD calibration level 1*)

- Applied de-distortion map (L3a Version 1) to IST data
- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans

ANC09 Release 15 (*PAD calibration level 4*)

- Applied scan-maneuver calibrations
- Removed pre-launch laser alignment and subsequent biases

ANC09 Release 13 (*PAD calibration level 3*)

- Applied de-distortion map (L2a Version 1) to IST data
- Applied ANC09 Release 6 laser biases
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ANC09 Release 12 (*PAD calibration level 1*)

- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean and around-the-world scans

ANC09 Release 11 (*PAD calibration level 2*)

- Applied 50-ms correction to gyro time tags and implemented gyro time-tag interpolation algorithm
- Added Laser Profiling Array (LPA) centroid (X,Y) and pulse orientation with respect to LPA X-axis at 40-Hz
- Applied ANC09 Release 8 laser biases

ANC09 Release 9 (*PAD calibration level 3*)

- Applied 50-ms correction to gyro time tags and implemented gyro time-tag interpolation algorithm
- Added LPA centroid (X,Y) and pulse orientation with respect to LPA X-axis to each 40-Hz record
- Applied ANC09 Release 6 laser biases

ANC09 Release 8 (*PAD calibration level 2*)

- Applied modeled LRS corrections to compensate for IST motion with respect to the instrument
- Updated and applied laser biases to pre-launch alignment

ANC09 Release 7 (*PAD calibration level 1*)

- (L2c) Applied Laser 2b ANC09 Release 6 laser biases

ANC09 Release 6 (*PAD calibration level 3*)

- Applied direct LRS corrections to compensate for IST motion with respect to the instrument
- Corrected star catalog precession error
- Updated and applied laser biases to pre-launch alignment (L2a)
- Applied Laser 2a ANC09 Release 6 laser biases (L3a)
- Removed incorrect adjustment of laser biases to account for velocity aberration

ANC09 Release 2 (*PAD calibration level 1*)

- Tuned EKF parameters

- Changed LPA orientation to be measured with respect to topocentric North
- Added ANC09 RELEASE keyword to standard header
- Added USEBEG and USEEND keywords to file-specific header
- Added DEGRADE_INDEX_START and DEGRADE_INDEX_STOP keywords to file-specific header
- Applied Laser 1 ANC09 Release 2 laser biases (L2a)
- Applied additional laser biases to pre-launch alignment based on range-residual analysis of ocean scans (L1)

ANC09 Release 10 (*PAD calibration level 1*)

- Used pre-launch estimate of laser alignment (no additional biases)
- The number 10 was incorrectly used to label products that were actually Release 1