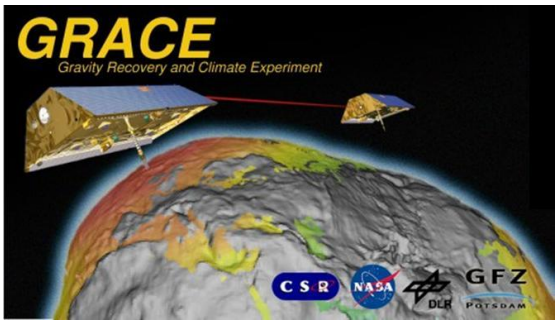
GRACE Science Data System Monthly Report August 2014



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Highlights:

- CSR has generated and delivered RL05 Level-2 products for August and September 2014.
- GFZ has generated and delivered RL05a Level-2 products for August 2014.
- JPL has generated and delivered RL05.1 Level-2 products for the period April 2002 till August 2014. The main differences between RL05.1 and RL05 are the changes to the IERS2010 reference system and use of the 100x100 S1&S2 air tides from Ray/Ponte (2003). RL05.1 also includes the reprocessed AOD RL05 from June 2013 till July 2014 (see below). Further information will be provided in the JPL Level-2 Release Notes and the JPL Level-2 Processing Standards Document.
- The proceedings of the GRACE Science Team Meeting, which took place at GFZ in Potsdam between September 29 and October 1, are available at http://www.gfz-potsdam.de/grace/gstm/gstm-2014.
- Due to an error in the handling of the input datasets (see also July 2014 newsletter), the AOD1B de-aliasing fields for the period from June 26, 2013 through July 31, 2014 had to be reprocessed and have been updated in the archives. The nature of the AOD1B error and their impact on GRACE Level-2 gravity fields are detailed at the GFZ AOD1B product website (http://www.gfz-potsdam.de/aod1b) and also in the GSTM2014 presentations of session A.0 (see link to GSTM2014 proceedings above).
- As a consequence all of the Level-2 data for this duration has been re-processed and the Level-2 fields for the months from June 2013 through July 2014 have been replaced at the PODAAC/ISDC archives. If you downloaded the CSR RL05 Level-2 products GSM, GAC and GAD files for June 2013 through July 2014 solutions prior to October 6, 2014, please download those files again from the GRACE archives. The corresponding reprocessed GFZ

products can be recognized by a product generation date '20140917' or later (the date can be found in the record 'FIRST' of Level-2 product files). JPL has reprocessed the complete time series April 2002 till August 2014 as RL05.1 (see above).

- The next GRACE Science Team Meeting is scheduled for September 21-23, 2015 in Austin. Further information will follow on the GSTM website at CSR at http://www.csr.utexas.edu/grace/GSTM/ .

Satellite Science Relevant Events:

- Operations in Science Mode throughout the month except for the periods highlighted in the L1B Data Processing section below.
- The actual mission status can be monitored at http://www.csr.utexas.edu/grace/operations/mission_status/.
- The GRACE-1 Brouwer mean orbital elements on August 31, 2014 00:00:00 are as follows:

  A [m] = 6789472.059
  E [-] = 0.000947
  I [º] = 89.004129
- The satellites separation was 217 km on August 29, 2014 with a rate of 0.8 km/d. The next orbit maneuver will be needed in December 2014.

Level-0 raw data dump reception statistics at DLR ground stations Weilheim and Neustrelitz:

GRACE-A Housekeeping:	100.0 %	GRACE-B Housekeeping:	100.0 %
GRACE-A Science:	100.0 %	GRACE-B Science:	100.0 %

Level-1 Data Processing:

- Level-1B Release 02 instrument data have been processed at JPL and archived at GFZ ISDC and JPL PO.DAAC. Please refer to the statistics below.
- RL02 Notes:
  - On 2014-07-31 at 14:01:14 the GRACE-A & B KBR instruments were powered on for about 70-80 minutes per orbit because the battery could not sustain the KBR power load for a complete orbit.
  - On 2014-08-02 00:00:00 the KBR started to operate for the full orbit, returning to nominal operations.
  - On 2014-08-04 00:00:00 the GRACE-A & B ACC biases stabilized after power on (2014-

08-31)

- On 2014-08-16 a MMU (mass memory unit) anomaly on GRACE-B resulted in science and housekeeping telemetry data loss on board from 05:06:44 to 05:53:24. This data is permanently lost.
- KBR statistics:

  A) KBR1B product name

  B) Total arc length with data (hours)

  C) Number of observations used in residual calculation

  D) KBR-GPS range residual RMS (cm)

  E) minimum KBR-GPS range residual (cm)

  F) maximum KBR-GPS range residual (cm)

  G) number of continuous segments in the KBR product

	A	B	C	D	E	F	G
KBR1B_2014-08-01_X_02.dat	20.1	14489	0.48	-1.8	1.9	20	
KBR1B_2014-08-02_X_02.dat	22.2	16026	0.37	-1.0	1.5	11	
KBR1B_2014-08-03_X_02.dat	23.7	17073	0.40	-1.3	1.5	6	
KBR1B_2014-08-04_X_02.dat	23.8	17145	0.38	-1.6	1.7	2	
KBR1B_2014-08-05_X_02.dat	23.9	17244	0.47	-2.1	2.5	3	
KBR1B_2014-08-06_X_02.dat	23.9	17244	0.31	-1.0	1.3	3	
KBR1B_2014-08-07_X_02.dat	24.0	17280	0.37	-1.3	1.4	1	
KBR1B_2014-08-08_X_02.dat	24.0	17280	0.44	-2.0	2.2	1	
KBR1B_2014-08-09_X_02.dat	24.0	17280	0.33	-1.8	1.1	1	
KBR1B_2014-08-10_X_02.dat	23.9	17235	0.41	-1.6	1.2	3	
KBR1B_2014-08-11_X_02.dat	23.6	16965	0.52	-2.4	2.8	2	
KBR1B_2014-08-12_X_02.dat	24.0	17258	0.34	-1.2	1.2	2	
KBR1B_2014-08-13_X_02.dat	23.8	17125	0.43	-1.3	1.9	3	
KBR1B_2014-08-14_X_02.dat	23.9	17242	0.36	-1.1	1.2	3	
KBR1B_2014-08-15_X_02.dat	23.7	17070	0.34	-1.2	1.2	3	
KBR1B_2014-08-16_X_02.dat	23.1	16605	0.36	-1.3	3.6	2	
KBR1B_2014-08-17_X_02.dat	23.8	17170	0.42	-1.3	2.2	4	
KBR1B_2014-08-18_X_02.dat	23.8	17122	0.48	-2.8	1.4	3	
KBR1B_2014-08-19_X_02.dat	23.9	17213	0.55	-2.4	2.3	4	
KBR1B_2014-08-20_X_02.dat	24.0	17250	0.45	-1.6	2.6	2	
KBR1B_2014-08-21_X_02.dat	24.0	17251	0.39	-1.8	1.1	2	
KBR1B_2014-08-22_X_02.dat	23.9	17242	0.45	-2.0	2.2	3	
KBR1B_2014-08-23_X_02.dat	23.9	17208	0.39	-1.1	1.8	4	
KBR1B_2014-08-24_X_02.dat	24.0	17280	0.33	-1.1	1.1	1	
KBR1B_2014-08-25_X_02.dat	24.0	17280	0.42	-1.7	1.1	1	
KBR1B_2014-08-26_X_02.dat	23.5	16950	0.47	-2.4	1.2	3	
KBR1B_2014-08-27_X_02.dat	24.0	17257	0.54	-1.4	2.5	2	
KBR1B_2014-08-28_X_02.dat	23.8	17145	0.49	-3.5	1.4	2	

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KBR1B_2014-08-29_X_02.dat  23.6  17025  0.50    -1.9    2.4  5
KBR1B_2014-08-30_X_02.dat  24.0  17259  0.91    -1.6    6.8  2
KBR1B_2014-08-31_X_02.dat  23.8  17132  0.56    -2.4    1.9  3
```

Following JPL RL02 L1B products are publicly available (green). June and July 2002 and June 2003 (red) are not provided due to accelerometer problems. For several months a significant number of Level-1 data is not available (blue): January and June 2011 (accelerometer data), May and October 2012, March and August 2013 (accelerometer and K-Band data), January and February 2014 (K-Band data) and July 2014 (accelerometer and K-Band data). RL00 and RL01 production has stopped with December 2004 and April 2012, respectively. See also corresponding newsletters.

L1B data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												

- The L1B Read software has been updated to accommodate 64-bit machines but the software will also work on 32 bit machines. Please change RELEASE_2008-03-20 to RELEASE_2010-03-31 available at ftp://podaac.jpl.nasa.gov/allData/grace/sw/.
- Level-1B Release 01 generation has stopped with 30 April 2012.
- L1B De-aliasing Products Status (for details see AOD1B Product Description Document):
    - Release 01: Generation has been stopped June 30, 2007.
    - Release 03: Generation has been stopped January 31, 2007.
    - Release 04: Generated until April 30, 2012 and extended to 1976-2000 (see newsletter for December 2008). Generation has been stopped April 30, 2012.
    - Release 05: Generated for 1 January 2001 till 9 November 2014. **The data for the period 25 June 2013 till 27 July 2014 have been reprocessed (see Highlights Section) and substituted in the archives.** The reprocessed products can be recognized by a processing time stamp later than 26 August 2014 in the header. Further information is available at http://www.gfz-potsdam.de/AOD1B.
    - Following AOD1B products are publicly available (yellow: RL01, RL03 and RL04; green: RL01 and RL04, blue: RL04 only, ‘x’ RL05):

AOD1B	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976												
…												
1999												
2000												
2001	x	x	x	x	x	x	x	x	x	x	x	x
2002	x	x	x	x	x	x	x	x	x	x	x	x
2003	x	x	x	x	x	x	x	x	x	x	x	x
2004	x	x	x	x	x	x	x	x	x	x	x	x
2005	x	x	x	x	x	x	x	x	x	x	x	x
2006	x	x	x	x	x	x	x	x	x	x	x	x
2007	x	x	x	x	x	x	x	x	x	x	x	x
2008	x	x	x	x	x	x	x	x	x	x	x	x
2009	x	x	x	x	x	x	x	x	x	x	x	x
2010	x	x	x	x	x	x	x	x	x	x	x	x
2011	x	x	x	x	x	x	x	x	x	x	x	x
2012	x	x	x	x	x	x	x	x	x	x	x	x
2013	x	x	x	x	x	x	x	x	x	x	x	x
2014	x	x	x	x	x	x	x	x	x	x	x	

Level-2 Product Generation and Distribution:

Besides historical RL00 till RL04 and GFZ's RL05 time-series (see below) the following RL05 L2 products are presently available to the public (green: available, yellow: in preparation; red: missing due to accelerometer data or accelerometer and K-band data problems):

- **GFZ RL05a:** GSM solutions are available for April 2002 until August 2014. Corresponding background GAA, GAB, GAC and GAD products and calibrated errors (GSM*.txt) have been provided too. **Products for June 2013 till July 2014 have been reprocessed and replaced in the archives (see Highlights Section above)**. Further details are listed in the GFZ L2 Release Notes.

GFZ RL05a	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												

Additionally to the standard monthly solutions, GFZ also provides weekly RL05a solutions (aligned to GPS weeks) which contain spherical harmonic coefficients complete up to degree and order 30. Currently, available weekly solutions cover the time span from 2003/01/05 till 2013/07/28. The weekly Level-2 products (GSM + GAx files) can be downloaded at ISDC and PO.DAAC. When making your request at the ISDC retrieval pages, please choose "GFZ Potsdam weekly" as "Processing Facility" to obtain these products. At the PO.DAAC archive, they can be found in the directory "allData/grace/L2/GFZ/RL05_WEEKLY". Weekly products can be identified by the string "GW30" instead of "G---" in the product name.

- **CSR RL05:** GSM solutions for maximum degree and order 60 (incl. calibrated errors GSM*.txt) and 96 along with the GAC and GAD background model files are available for the period April 2002 until September 2014. **Products for June 2013 till July 2014 have been reprocessed and replaced in the archives (see Highlights Section above)**. Further details are listed in the CSR L2 Release Notes. Ongoing updates on CSR RL05 are provided at http://www.csr.utexas.edu/grace/RL05.html.

CSR RL05	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												

- **JPL RL05.1:** GSM solutions along with the GAA, GAB, GAC and GAD background model files and calibrated errors (GSM*.txt) are available for the period April 2002 until August 2014. Details are listed in the JPL L2 Release Notes. See also comments in the Highlights Section above.

JPL RL05.1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												

- GFZ has stopped RL05 processing end of July 2013 (now substituted by RL05a). For further details see Newsletter October 2013.
- JPL has stopped RL05 processing end of June 2014 (now substituted by RL05.1). For further details see Newsletter August 2014.
- GFZ and CSR have stopped RL04 processing end of April 2012
- JPL has stopped RL04 processing end of January 2012
- GFZ has stopped RL03 processing (Feb 2003 until Jan 2007 available at the archives. For further details refer to the GFZ RL03 release notes for Level-2 products).
- CSR has stopped RL01 processing. (Apr. 2002 until Dec 2006 available at the archives. For further details refer to the CSR RL01 release notes for Level-2 products).
- JPL has stopped RL02 processing (January 2003 until November 2005 available at the archives. For further details refer to the JPL RL02 release notes for Level-2 products).
- TN05/TN07 containing C20 estimates derived from SLR and using GRACE RL04/RL05 standards is periodically updated.

Miscellaneous:

- Lecture material from the 2011 and 2014 summer schools of the DFG Special Priority Program "Mass transport and mass distribution in the system Earth" can be downloaded at www.massentransporte.de. Before using, please read the agreements on the cover page.
- The following acknowledgement shall be added to any new GRACE related publication (paper, poster etc.): *Acknowledgement: We would like to thank the German Space Operations Center (GSOC) of the German Aerospace Center (DLR) for providing continuously and nearly 100% of the raw telemetry data of the twin GRACE satellites.*
- A list of GRACE related publications which can be sorted by author or date is available at

http://www.gfz-potsdam.de/en/research/organizational-units/departments-of-the-gfz/department-1/global-geomonitoring-and-gravity-field/topics/development-operation-and-analysis-of-gravity-field-satellite-missions/grace/grace-related-publications/, alternatively the list can be accessed via http://www.gfz-potsdam.de/en/grace and one further click on 'GRACE related publications' in the left column. The current status is 1239 papers. This list may be still incomplete. If you are missing a publication please send an e-mail to Frank Flechtner (flechtne@gfz-potsdam.de).

- Science data users are encouraged to submit citations of their own and other works related with GRACE to the bibliography web page implemented at PO.DAAC: http://podaac.jpl.nasa.gov/grace/bibliography.html.