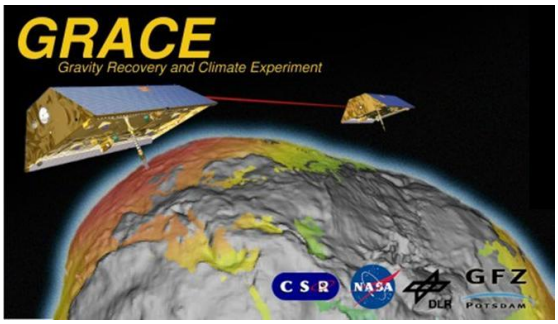
# GRACE Science Data System Monthly Report October 2013

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**Highlights:**

- CSR has generated and delivered RL05 Level-2 products for April, May and August till December 2002.
- RL05 Level-2 products for October 2013 have not yet been generated due to late provision of Level-1B data (caused by a beowulf cluster replacement, which is used at JPL for the final Quality Assurance check).
- **GFZ has generated and delivered a reprocessed RL05 time series called RL05a for January 2003 till July 2013. All RL05a Level-2 products are available at ISDC and PO.DAAC. When making your request at the ISDC retrieval pages, the RL05a GSM products can be found under the same revision number ("5") as the RL05 GSM products and are distinguishable by the string "_005a" (instead of "_0005") at the end of the product name. At the PO.DAAC archive, the RL05a GSM products can be found in the directory "allData/grace/L2/GFZ/RL05". Note that GAx products are not affected and need not to be replaced! Further details are described in the "Release notes for GFZ RL05 GRACE L2 products", also available at both archives. For the missing months in 2002 (soon to be delivered) and all upcoming months starting with October 2013, only RL05a products will be generated, i.e. the GFZ RL05 time-series will not be continued.**
- The GRACE Science Team Meeting 2013 has taken place 23-25 October 2013 at UTCSR. Proceedings are available at http://www.csr.utexas.edu/grace/GSTM/proceedings.html.
- The next GRACE Science Team Meeting is planned at GFZ in Potsdam between September 29 and October 2, 2014. Further information will follow next summer.
- The SPP1257 Mass Transport Program will organize a summer school on "GRACE/GRACE-FO applications for the terrestrial water cycle", September 15-19, 2014. More information will be provided soon via the SPP1257 website http://www.massentransporte.de.

**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 October 31, 2013 00:00:00 are as follows:

  A [m] = 6806968.668
  E [-] = 0.001201
  I [º] = 89.016737
- The satellites separation was 225 km on October 31, 2013 with a rate of 1.23 km/d. The next orbit maneuver will be needed about end of March 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 2013-08-28 the maximum GPS satellites to be tracked was commanded to 8 instead of the nominal 10 on GRACE-A. This resulted in less GPS satellites tracked and a minor degradation in the GRACE-A orbit accuracy which is reflected in the higher KBR-GPS RMS statistics since the return of the KBR1B data on 2013-09-24. On 2013-10-18 the maximum satellites to be tracked was commanded back to 10 on GRACE-A.
  - On 2013-10-18 the K phase was missing after a restart tracker command at 23:51:54 on GRACE-B. The K phase was restored at 2013-10-19 07:07:00 after an IPU (Instrument Processing Unit) reboot. The KBR1B data is missing during this interval.
  - 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_2013-10-01_X_02.dat | 23.7 | 16972 | 0.92 | -3.3 | 2.8 | 4 |
| KBR1B_2013-10-02_X_02.dat | 24.0 | 17280 | 0.89 | -2.8 | 2.7 | 1 |
| KBR1B_2013-10-03_X_02.dat | 24.0 | 17280 | 1.03 | -3.9 | 2.7 | 1 |
| KBR1B_2013-10-04_X_02.dat | 24.0 | 17251 | 0.96 | -2.2 | 5.1 | 2 |
| KBR1B_2013-10-05_X_02.dat | 24.0 | 17280 | 0.92 | -3.6 | 2.4 | 1 |
| KBR1B_2013-10-06_X_02.dat | 24.0 | 17257 | 0.90 | -2.5 | 4.3 | 2 |
| KBR1B_2013-10-07_X_02.dat | 24.0 | 17280 | 0.80 | -2.8 | 2.9 | 1 |
| KBR1B_2013-10-08_X_02.dat | 24.0 | 17280 | 0.97 | -3.8 | 3.9 | 1 |
| KBR1B_2013-10-09_X_02.dat | 24.0 | 17258 | 0.70 | -3.0 | 2.7 | 2 |
| KBR1B_2013-10-10_X_02.dat | 23.9 | 17227 | 0.62 | -1.9 | 2.0 | 3 |
| KBR1B_2013-10-11_X_02.dat | 23.9 | 17237 | 1.27 | -3.8 | 5.2 | 3 |
| KBR1B_2013-10-12_X_02.dat | 24.0 | 17280 | 1.01 | -3.3 | 2.6 | 1 |
| KBR1B_2013-10-13_X_02.dat | 23.7 | 17101 | 0.93 | -3.6 | 2.4 | 3 |
| KBR1B_2013-10-14_X_02.dat | 24.0 | 17253 | 0.98 | -3.6 | 3.9 | 2 |
| KBR1B_2013-10-15_X_02.dat | 23.8 | 17145 | 0.85 | -3.9 | 2.6 | 2 |
| KBR1B_2013-10-16_X_02.dat | 24.0 | 17258 | 1.08 | -2.8 | 4.7 | 2 |
| KBR1B_2013-10-17_X_02.dat | 24.0 | 17251 | 1.03 | -4.0 | 3.4 | 2 |
| KBR1B_2013-10-18_X_02.dat | 23.9 | 17176 | 1.21 | -4.1 | 6.1 | 1 |
| KBR1B_2013-10-19_X_02.dat | 16.6 | 11924 | 0.38 | -1.0 | 1.5 | 2 |
| KBR1B_2013-10-20_X_02.dat | 23.7 | 17067 | 0.95 | -1.8 | 7.1 | 1 |
| KBR1B_2013-10-21_X_02.dat | 23.9 | 17222 | 0.65 | -2.6 | 2.8 | 4 |
| KBR1B_2013-10-22_X_02.dat | 23.5 | 16920 | 0.47 | -2.1 | 1.5 | 7 |
| KBR1B_2013-10-23_X_02.dat | 23.5 | 16933 | 1.14 | -3.8 | 5.8 | 5 |
| KBR1B_2013-10-24_X_02.dat | 23.9 | 17206 | 0.48 | -1.3 | 2.4 | 4 |
| KBR1B_2013-10-25_X_02.dat | 23.9 | 17233 | 0.56 | -2.1 | 1.7 | 3 |
| KBR1B_2013-10-26_X_02.dat | 23.5 | 16941 | 0.61 | -2.9 | 3.3 | 3 |
| KBR1B_2013-10-27_X_02.dat | 23.8 | 17176 | 0.68 | -3.9 | 1.9 | 5 |
| KBR1B_2013-10-28_X_02.dat | 23.7 | 17100 | 0.67 | -2.6 | 1.9 | 4 |
| KBR1B_2013-10-29_X_02.dat | 23.2 | 16702 | 1.01 | -2.6 | 6.4 | 3 |
| KBR1B_2013-10-30_X_02.dat | 23.6 | 16968 | 0.58 | -2.2 | 2.2 | 6 |
| KBR1B_2013-10-31_X_02.dat | 24.0 | 17258 | 0.81 | -4.6 | 2.8 | 2 |

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 and March and August 2013 (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 | | | | | | | | | | | | |
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- 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 8 December 2013. 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 | |

**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 January 2003 until July 2013. Corresponding background GAA, GAB, GAC and GAD products and calibrated errors (GSM*.txt) have been provided too. Details are listed in the GFZ L2 Release Notes.

| GFZ RL05a | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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  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 along with the GAC and GAD background model files are available for the period April 2002 until July 2013. So far no calibrated errors (GSM*.txt) are available, but will be provided later. Note that CSR has put zeroes in the GSM files in

fields that contain the formal errors. 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 | | | | | | | | | | | | |
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- **JPL RL05:** GSM solutions along with the GAA, GAB, GAC and GAD background model files and calibrated errors (GSM*.txt) are available for the period January 2003 until July 2013. Details are listed in the JPL L2 Release Notes.

| JPL RL05 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | | | | | | | | | | | | |
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- GFZ has stopped RL05 processing end of July 2013 (now substituted by RL05a)
- 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 summer school 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 1129 papers. This list maybe 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.