GRACE Science Data System Monthly Report
December 2005

Prepared by:	Frank Flechtner	GFZ	flechtne@gfz-potsdam.de
Contributions by:	Srinivas Bettadpur	UTCSR	srinivas@csr.utexas.edu
	Mike Watkins	JPL	michael.m.watkins@jpl.nasa.gov
	Gerhard Kruizinga	JPL	gerhard.kruizinga@jpl.nasa.gov
Approved by:	Byron Tapley	UTCSR	tapley@csr.utexas.edu
	Christoph Reigber	GFZ	reigber@gfz-potsdam.de

Highlights:

- The GRACE satellites have been successfully exchanged to minimize aging effects of the K-band antennae due to atomic oxygen. Additional information on the swap maneuver can be found in http://www.csr.utexas.edu/grace/operations .

Satellite Science Relevant Events:

- Nominal operation in Science Mode until December 3 when satellite separation was 202 km.
- Then, a sequence of several yaw turn maneuvers and two major burns of approximately 10 minutes (orbit trim maneuver OTM-1) were performed on GRACE-2 which decreased the separation distance with a closest approach of only 406 meters (!) on December 10. Due to safety reasons the K-band was switched off at a distance below 20 km. During maneuvers K-band data are not available too (see “Level-1 Data Processing” below).
- Since December 10 03:45 GRACE-2 is the leading satellite.
- OTM-2 on December 12, by design, reduced the separation rate to about 3 km/d in order to collect 1 month’s data at reduced separations (70-170 km).
- Initial check of the preliminary December L1B data show nominal performance. Level-1 and Level-2 data processing completed proficiency tests in the new configuration.
- Mid of January when the separation distance has reached the outer separation limit of 170 km the next orbit trim maneuver OTM-3 will be performed to continue operation in nominal separation of 220 km ± 50 km.
- The GRACE-1 Brouwer mean orbital elements on January 02, 2006 00:00:00 are as follows:

A [m] = 6843633.382
E [-] = 0.001631
I [º] = 89.031149

The satellites separation was 137 km on January 1, 2006 with a rate of 3.2 km/d.

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

GRACE-1 Housekeeping:	99.8 %
GRACE-1 Science:	100.0 %
GRACE-2 Housekeeping:	99.8 %
GRACE-2 Science:	100.0 %

Level-1 Data Processing:

- Level-1B Release 01 instrument data have been processed at JPL and archived at GRACE-ISDC and JPL PO.DAAC.
- Notes:
    - On 2005-12-03 GRACE-B executed an orbit trim maneuver which started the drift to swap the GRACE spacecraft. Approximately 6 hours of KBR1B data is lost because GRACE-B was turned 180 deg in yaw for the maneuver.
    - On 2005-12-08 at 10:33 UTC both GRACE-A and GRACE-B were put in Attitude Hold Mode and the 1 deg pitch bias was removed as well. This change was necessary for closest approach operations. A degradation of the KBR1B product was observed in the Level-2 prefit check after 10:33 UTC.
    - On 2005-12-09 GRACE-B slewed 180 deg to avoid KBR damage during closest approach at 2005-12-10 11:34:54. This resulted in about 13 hrs of KBR1B data lost.
    - On 2005-12-10 all KBR1B data is missing because GRACE-B remained 180 deg slewed to avoid KBR damage during closest approach.
    - On 2005-12-11 GRACE-A slewed 180 deg to re-establish KBR link at 2005-12-11 04:24:34. Furthermore GRACE-A experienced coarse pointing mode due to 24 minute long IPU reboot starting at 09:49:34. In total about 6 hours of KBR1B data is lost
    - On 2005-12-12 GRACE-B performed OTM-2 from 2005-12-12 17:05:44 till 2005-12-12 17:15:55. KBR1B missing from 2005-12-12 14:53 till 2005-12-12 19:34 because of 180 deg slew needed for OTM-2. In total about 6 hours of KBR1B data is lost.

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_2005-11-25_X_01.dat	24.0	17260	1.47	-3.8	3.5	1
KBR1B_2005-11-26_X_01.dat	24.0	17260	1.08	-3.5	2.7	1
KBR1B_2005-11-27_X_01.dat	23.5	16950	1.24	-3.1	5.8	3
KBR1B_2005-11-28_X_01.dat	24.0	17280	1.36	-5.3	3.6	1
KBR1B_2005-11-29_X_01.dat	23.8	17145	1.14	-2.7	3.5	2
KBR1B_2005-11-30_X_01.dat	24.0	17280	1.41	-2.7	4.3	1
KBR1B_2005-12-01_X_01.dat	24.0	17280	1.41	-3.7	4.3	1
KBR1B_2005-12-02_X_01.dat	23.7	17070	1.36	-2.9	4.0	3
KBR1B_2005-12-03_X_01.dat	18.3	13204	1.32	-3.4	4.1	3
KBR1B_2005-12-04_X_01.dat	24.0	17280	1.17	-3.2	4.3	1
KBR1B_2005-12-05_X_01.dat	23.9	17247	1.23	-3.4	3.4	3
KBR1B_2005-12-06_X_01.dat	24.0	17251	1.22	-3.9	3.1	2
KBR1B_2005-12-07_X_01.dat	24.0	17280	1.21	-3.1	3.7	1
KBR1B_2005-12-08_X_01.dat	23.8	17145	1.26	-3.2	3.2	2
KBR1B_2005-12-09_X_01.dat	11.2	8101	1.44	-2.7	4.2	2
KBR1B_2005-12-10_X_01.dat	-	-	-	-	-	-
KBR1B_2005-12-11_X_01.dat	18.8	13530	1.69	-5.2	5.2	4
KBR1B_2005-12-12_X_01.dat	18.8	13482	1.21	-3.2	3.1	2
KBR1B_2005-12-13_X_01.dat	23.7	17103	1.41	-3.1	5.1	5
KBR1B_2005-12-14_X_01.dat	23.9	17235	1.27	-3.9	3.3	3
KBR1B_2005-12-15_X_01.dat	23.8	17145	1.10	-3.3	3.2	2
KBR1B_2005-12-16_X_01.dat	24.0	17280	1.23	-3.7	3.5	1
KBR1B_2005-12-17_X_01.dat	24.0	17280	1.30	-4.9	2.8	1
KBR1B_2005-12-18_X_01.dat	24.0	17280	1.40	-4.3	3.0	1
KBR1B_2005-12-19_X_01.dat	23.8	17167	1.19	-3.2	3.1	3
KBR1B_2005-12-20_X_01.dat	23.8	17145	1.45	-4.9	3.0	2
KBR1B_2005-12-21_X_01.dat	24.0	17266	1.24	-4.2	3.0	2

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KBR1B_2005-12-22_X_01.dat  24.0  17254  1.47    -3.4    3.4  2
KBR1B_2005-12-23_X_01.dat  not yet distributed
…
KBR1B_2005-12-31_X_01.dat  not yet distributed
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- Release 01 Level-1B barotropic sea level products (OCN1B) and de-aliasing products (AOD1B) were calculated by GFZ until December 31, 2005 and archived at GRACE-ISDC.
- Release 03 Level 1B de-aliasing products (AOD1B) based on OMCT (Ocean Model for Circulation and Tides) baroclinic ocean model for December 2005 will be generated mid of January 2006.

Level-2 Data Processing:

- All 3 L2 centers at CSR, JPL and GFZ continued reprocessing of release 02 (CSR, JPL) and 03 (GFZ) based on new standards, background models and processing strategies.

GRACE Product Distribution:

- Constrained field from UTCSR, and the associated Level-1B products, for October 2005 are now available to the GRACE Science Team at PO.DAAC and ISDC.

Miscellaneous:

- GRACE Science Team Meeting (GSTM) proceedings are available online (http://www.csr.utexas.edu/grace/GSTM).
- 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.