

GRACE Follow-On

Science Data System Newsletter

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GRACE Follow-On Science Data System & Highlights:

- Level-1 data products, which are available at NASA's Physical Oceanography Distributed Active Archive Center ([PO.DAAC](#)) and GFZ's Information System and Data Center ([ISDC](#)), have been continuously updated since the first data release on May-24, 2019. The Level-1 data includes all fields required for the generation of Level-2 gravity field products, and will be updated approximately every 7 days. Please refer to Level-1 release notes and documentation ([PO.DAAC](#) / [ISDC](#)) for a detailed description of the data, file formats, updates, and conventions.
- Level-2 data SDS products for **May-2019** have been generated and are now available at NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC) and GFZ's Information System and Data Center (ISDC). The Level-2 products includes the monthly gravity fields from the three mission Science Data System centers (JPL, GFZ, CSR), as well as the corresponding atmosphere and ocean dealiasing (AOD) background model data. Please refer to Level-2 data set release notes and documentation (at PO.DAAC and ISDC) for a detailed description of the data, file formats, updates, conventions, as well as important processing recommendations.

The GRACE Follow-On Project team is looking forward to presentations and discussions of data quality, findings and analyses at the **Science Team Meeting in Pasadena this fall (Oct 8-10, 2019)**. Invitations to attend the Science Team Meeting will be sent out mid-August. **Save the date!**

Calendar & Upcoming Events:

- 1st GRACE-FO LRI Level-1 data release (no later than July-28, 2019)
- GRACE / GRACE-FO Science Team Meeting (Oct 8-10, 2019, Pasadena, CA, U.S.A.)



- AGU Fall Meeting 2019
 - Please consider submitting an abstract to the session on '[Continuous Measurements of Earth System Mass Change: GRACE, GRACE-FO and Beyond](#)'. Submission **deadline is July-31, 2019**.

GRACE Follow-On: Mission Status

GRACE Follow-On: Orbit

The GRACE Follow-On orbital parameters on 2019-06-21 (day 172) were as follows:

Sun Beta (deg)	66.5
Absolute Separation Distance (km)	175.7
Drift (km/d)	0.05
Mean Altitude (>6378.1 km)	491.0
Decay Rate (GF1/GF2) (7d mean, m/d)	0.6 / 0.5

Science-relevant Mission Events & Plans:

- Operations in science ranging mode and collecting K/Ka-band ranging observations.
- Laser Ranging is enabled.
- The GF2 ACC is in Large-Range-Mode (LRM). The project is providing a transplant ACT1B data product for GF2 to substitute the GF2 ACC measurements (please check the ACT-Readme for details).
- Monthly Center-of-Mass offset verification (regular activity).
- Additional calibration periods & spacecraft activities are highlighted in Level-1 v04 notes and event log below.

Level-1, Level-2, Level-3 Data Processing

Level-1 Data Processing & Delivery

- Level-1 v04 instrument data have been processed at JPL and are archived at JPL [PO.DAAC](#) and GFZ [ISDC](#). Please refer to the statistics below.
- Please refer to the Level-1 Release Notes as well as to the Sequence-of-Events (SOE) logfile for important updates and comments ([PO.DAAC](#) / [ISDC](#)).

Date	Events
2018-06-04	GRACE-C performed CoM calibration test - NOM-AH from 11:31 - 14:48 GRACE-D performed CoM calibration test - NOM-AH from 13:07 - 16:21
2019-06-01	GRACE-C spontaneous IPU reboot at 09:23:10.0000



2019-06-06	GRACE-C ACC temperature calibration (brief test version) occurred from approximately 07:15 to 10:51
2019-06-07	GRACE-D spontaneous IPU reboot at 18:12:56, causing approx. 300s data gap
2019-06-12	GRACE-C ACC temperature calibration started at approximately 06:30
2019-06-15	GRACE-C ACC temperature calibration finished at approximately 19:09
2019-06-20	142-second gap in GNV1A was caused by IPU tracking fewer than 4 Satellites during that interval (142 seconds). Since the gap did not exceed the IPU internal no-Nav Solution timeout of 240 seconds, it did not trigger a reboot.
2019-06-20	Based on carrier-to-noise density ratio observation (C/N0) of IGS receivers, global flex power operation was observed on 2019-06-20 and 2019-06-21. Flex power started subsequently for all healthy Block IIR-M and IIF satellites on June 20 between 15:18 and 17:49 UTC. C/N0 of the P(Y)-code tracking increased by roughly 10 dB for all healthy Block IIR-M and IIF satellites whereas C/N0 of the C/A-code decreased by about 2-3 dB for the healthy IIR-M satellites only. The changes in power levels are similar to flex power mode III discussed in Steigenberger P, Thörlert S, Montenbruck O. (2019) Flex power on GPS Block IIR-M and IIF, GPS Solutions, doi:10.1007/s10291-018-0797-8. All satellites returned to normal power levels on June 21 between 6:00 and 10:00 UTC. The above flex power degraded Grace-FO orbit performance by a few millimeter level.
2019-06-21	See the entry of 2019-06-20
2019-06-22	CoM calibration on both spacecraft, extending into the next day GRACE-C: CMCal start: 20190622 22:30, CMCal end: 20190623 13:15 GRACE-D: CMCal start: 20190622 20:26, CMCal end: 20190623 13:00
2019-06-23	GRACE-D spontaneous IPU reboot at 09:23:30.0000
2019-06-24	The IPU parameters were re-instated and GPS PRN #4 was disabled at 18:50 (follow-up procedure after the IPU restart on 2019-06-23).
2019-06-27	A spontaneous IPU reboot at 09:35:10
2019-06-28	The IPU parameters were re-instated and GPS PRN #4 will be disabled again at 15:50 (follow-up procedure after the IPU restart on 2019-06-27).

KBR Performance Statistics

- [see Appendix 1A (p. 5)]

Level-1 Data Product Availability

- [see Appendix 1B (p. 5) for GRACE-FO Level-1 data]
- [see Appendix 1C (p. 6) for de-aliasing AOD1B model data]

Level-2 Data Processing & Delivery

Level-2 Data availability

- Level-2 Release 06 data have been processed at JPL, GFZ and CSR and are archived at JPL [PO.DAAC](#) and GFZ [ISDC](#).
- Please refer to the Level-2 Release Notes as well as to the Sequence-of-Events (SOE) logfile for important updates and comments ([PO.DAAC](#) / [ISDC](#)).
- [see Appendix 2A (p. 6) for overview tables on data availability].



Level-2 Ancillary Products and Comments

- TN-11 containing C20 estimates derived from SLR and using Level-2 RL06 standards (Cheng and Ries, 2013) is frequently updated. It is recommended to replace the native GRACE-FO C20 coefficient with this product.
- TN-13[a,b,c] containing geocenter estimates using the methods of Swenson et al. (2010) and Sun et al. (2016) is frequently updated. It is recommended to augment the GRACE / GRACE-FO geocenter with this product.
 - NOTE: A previous version from 04/2019 had an inconsistent epoch removed - please update all TN-13 data with the most recent version; this affected all monthly data points only by a constant value.
- TN-14 containing C30 estimates derived from SLR and using Level-2 RL06 standards (Loomis et al., 2019) is frequently updated. It is recommended to replace the native GRACE-FO C30 coefficient with this product.

Level-3 Data Processing & Delivery

- Level-3 data products will be released in the coming weeks – stay tuned!

Resources and Links:

Data Archive Links:

- NASA PO.DAAC (<http://podaac.jpl.nasa.gov>)
- GFZ ISDC (<https://isdc.gfz-potsdam.de/grace-fo-isdc>)

Miscellaneous Links:

- For GRACE Follow-On mission updates and news, please visit <https://gracefo.jpl.nasa.gov> and <http://gfz-potsdam.de/en/grace-fo>.
- The proceedings of previous GRACE / GRACE-FO Science Team Meetings are available at <https://www.gfz-potsdam.de/en/grace/>.
- Searchable databases of **GRACE and GRACE-FO related publications** are available at
 - http://www-app2.gfz-potsdam.de/pb1/op/grace/references/sort_date.html
 - <https://grace.jpl.nasa.gov/publications/>
 - If you are missing a publication please send an e-mail to Frank Flechtner (flechtne@gfz-potsdam.de) or contact the JPL team via <https://grace.jpl.nasa.gov/about/feedback/>.



Appendix

1.A - KBR Performance Statistics

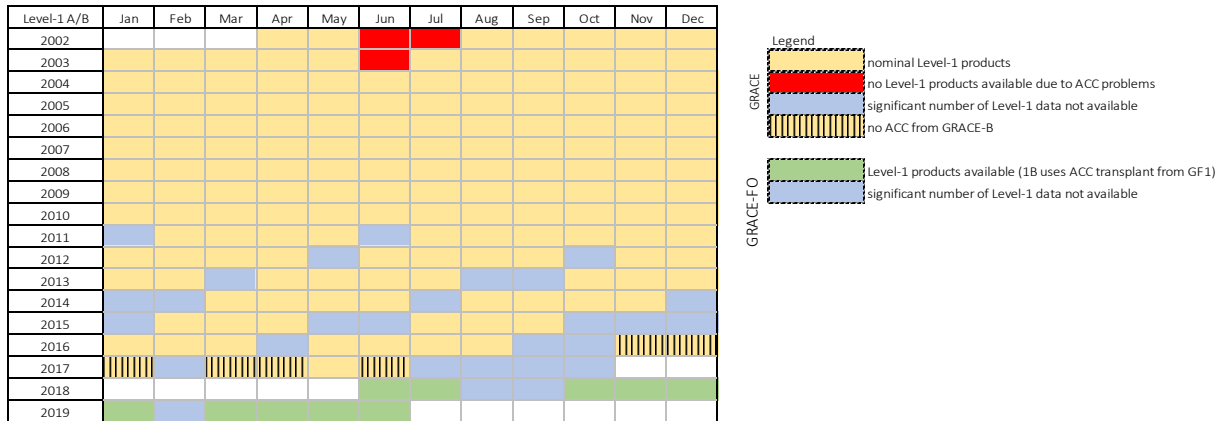
KBR QUALITY ASSESSMENT

Key to columns in the table below

- 1) KBR1B product name
- 2) Total arc length with data (hours)
- 3) Number of observations used in KBR-GPS range residual calculation
- 4) KBR-GPS range residual RMS (mm)
- 5) Minimum KBR-GPS range residual (mm)
- 6) Maximum KBR-GPS range residual (mm)
- 7) Number of continuous segments in the KBR product

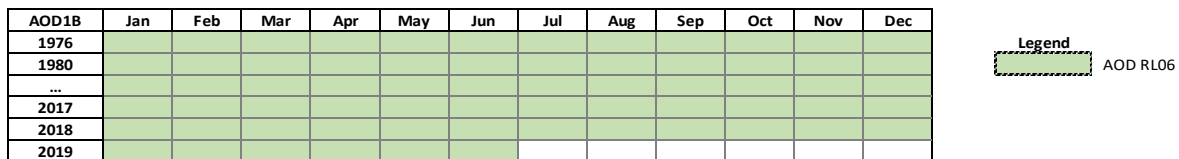
KBR1B_2019-06-01_Y_04.dat	24.0	17173	1.41	-4.3	4.6	2
KBR1B_2019-06-02_Y_04.dat	24.0	17280	1.48	-4.6	4.8	1
KBR1B_2019-06-03_Y_04.dat	24.0	17280	1.38	-5.2	4.7	1
KBR1B_2019-06-04_Y_04.dat	24.0	17280	1.38	-4.7	6.3	1
KBR1B_2019-06-05_Y_04.dat	24.0	17280	1.49	-6.5	5.0	1
KBR1B_2019-06-06_Y_04.dat	24.0	17280	1.41	-5.3	3.6	1
KBR1B_2019-06-07_Y_04.dat	24.0	17187	1.22	-5.1	4.4	2
KBR1B_2019-06-08_Y_04.dat	24.0	17280	1.41	-3.5	4.6	1
KBR1B_2019-06-09_Y_04.dat	24.0	17280	1.44	-3.9	4.5	1
KBR1B_2019-06-10_Y_04.dat	24.0	17280	1.49	-3.8	5.4	1
KBR1B_2019-06-11_Y_04.dat	24.0	17280	1.65	-5.0	5.2	1
KBR1B_2019-06-12_Y_04.dat	24.0	17280	1.57	-4.2	6.0	1
KBR1B_2019-06-13_Y_04.dat	24.0	17280	1.55	-5.9	5.5	1
KBR1B_2019-06-14_Y_04.dat	24.0	17280	1.45	-5.5	5.0	1
KBR1B_2019-06-15_Y_04.dat	24.0	17280	1.67	-6.6	3.8	1
KBR1B_2019-06-16_Y_04.dat	24.0	17280	1.61	-5.3	7.4	1
KBR1B_2019-06-17_Y_04.dat	24.0	17280	1.46	-3.5	3.5	1
KBR1B_2019-06-18_Y_04.dat	24.0	17280	1.58	-4.9	5.5	1
KBR1B_2019-06-19_Y_04.dat	24.0	17280	1.61	-5.3	5.5	1
KBR1B_2019-06-20_Y_04.dat	24.0	17280	3.17	-9.6	21.3	1
KBR1B_2019-06-21_Y_04.dat	24.0	17280	4.35	-21.6	19.8	1
KBR1B_2019-06-22_Y_04.dat	24.0	17280	1.48	-3.5	5.8	1
KBR1B_2019-06-23_Y_04.dat	24.0	17068	1.54	-4.8	5.1	2
KBR1B_2019-06-24_Y_04.dat	24.0	17280	1.43	-5.6	4.6	1
KBR1B_2019-06-25_Y_04.dat	24.0	17280	1.64	-4.7	4.4	1
KBR1B_2019-06-26_Y_04.dat	24.0	17280	1.48	-4.8	4.0	1
KBR1B_2019-06-27_Y_04.dat	24.0	17125	1.52	-5.4	6.0	2
KBR1B_2019-06-28_Y_04.dat	24.0	17280	1.64	-4.9	8.4	1
KBR1B_2019-06-29_Y_04.dat	24.0	17280	1.44	-4.6	4.0	1
KBR1B_2019-06-30_Y_04.dat	24.0	17280	1.46	-5.7	3.6	1

1.B – Level-1 GRACE-FO Data Availability



Current version: Level-1 v04

1.C – Level-1 De-aliasing Model AOD1B Data Availability



- For more information on the AOD de-aliasing AOD1B model please visit <https://www.gfz-potsdam.de/en/aod1b/>.

2.A – Level-2 Product and Data Availability

JPL, GFZ & CSR

- Current Level-2 version: RL06
- All centers provide GSM solutions
 - Please check the Level-2 Release Notes for further details
- JPL and GFZ provide monthly de-aliasing models [GAA, GAB, GAC, GAD]; CSR provides [GAC, GAD].

GRAVITY RECOVERY AND CLIMATE EXPERIMENT *Follow-On*



Level-2 (JPL)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002				1	2			3	4	5	6	7
2003	8	9	10	11	12		13	14	15	16	17	18
2004	19	20	21	22	23	24	25	26	27	28	29	30
2005	31	32	33	34	35	36	37	38	39	40	41	42
2006	43	44	45	46	47	48	49	50	51	52	53	54
2007	55	56	57	58	59	60	61	62	63	64	65	66
2008	67	68	69	70	71	72	73	74	75	76	77	78
2009	79	80	81	82	83	84	85	86	87	88	89	90
2010	91	92	93	94	95	96	97	98	99	100	101	102
2011		103	104	105	106		107	108	109	110	111	112
2012	113	114	115	116		117	118	119	120		121	122
2013	123	124		125	126	127	128			129	130	131
2014	132		133	134	135	136		137	138	139	140	
2015	141	142	143	144	145		146	147	148			149
2016	150	151	152		153	154	155	156			157*+	158*+
2017	159*+		160*+	161*+	162*	163*+						
2018						1*+	2*+			3*+	4+	5+
2019	6+	7*+	8+	9+	10+							

GRACE

- Level-2 products (nominal)
- no Level-2 products available

GRACE-FO

- Level-2 products (ACC transplant from GF1)

Current Level-2 Release: RL06

- + Level-2 products (with ACC transplant)
- * partial / overlapping cal-months

Tab: GRACE and GRACE-FO Level-2 product availability.