



# GRACE Follow-On

## Science Data System Newsletter

### Report: Jan-Mar 2019 (No. 2)

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### **GRACE Follow-On Science Team & Highlights:**

On Jan 28, 2019, the mission exited Phase-D (in-orbit-checkout) and entered Phase-E and the beginning of science operations. During the first 120 days of Phase-E, the project's Science Data System (JPL, CSR, GFZ) team will conduct the validation and verification of the flight system operations and data processing approach to obtaining monthly gravity fields at a precision equivalent to that achieved with GRACE. Preliminary results from Phase-D and early Phase-E show that the system performance meets the Level 1 science and technology requirements of continuity with the 15-year record from GRACE.

Since launch (May-22, 2018), GRACE-FO has collected approximately 7 months of the science data which will be part of the first Level-1A/B data scheduled for release on or before May 28, 2019. The Level-2 gravity products and the observations from the LRI (Laser Ranging Interferometer) technology demonstration will be released as planned on or before July-27, 2019. The Science Data System will release the data through the US PO.DAAC (<http://podaac.jpl.nasa.gov>) and the German ISDC (<https://isdc.gfz-potsdam.de/grace-fo-isdc>) data portals (see important updates for PO.DAAC data access below). Detailed documentation of the Level-1 data processing and the adopted calibration strategies will be released concurrently with the data.

The next GRACE / GRACE-FO Science Team meeting will be held in Pasadena, from 8-10 Oct., 2019 on the campus of the California Institute of Technology. More detailed information will follow soon. Save the date!

The next solicitation for the US GRACE-FO Science Team was released by NASA's Science Mission Directorate (SMD) as part of its annual omnibus solicitation for basic and applied research, Research Opportunities in Space and Earth Science (ROSES) 2019 (<http://solicitation.nasaprs.com/ROSES2019>). Proposals are due June-14, 2019.

### **GRACE Follow-On: Mission Status**



As of March-19, 2019, GRACE-FO has been in science ranging mode and collecting K/Ka-band ranging observations. A detailed event log follows below.

### **Science-relevant Mission Events & Plans:**

- Microwave Instruments (MWI):
  - On October 22, 2018, the project completed a successful switchover to the redundant side of the GF2-MWI with the re-activation of K/Ka Band ranging (KBR) between the two GRACE-FO satellites. The MWI has performed nominally since then.
- GF2 On-Board Computer (OBC):
  - OBC-A on GF-2 was automatically shutdown on Feb 7, 2019, and functionality switched over to the redundant OBC-B at approximately 08:32 UTC on Feb. 7, 2019. The cause of this is likely related to a bus communication fault. All science instruments (incl. MWI, ACC, SCA, LRI) were powered off as the default response to this event.
  - The GF2 MWI-A (comprised of USO-A (Ultra Stable Oscillator), IPU-A (Instrument Processing Unit) and MWA-A (Microwave Assembly)) was then powered on successfully. The mission resumed science ranging operations on Feb. 21, and has been collecting K/Ka-Band Ranging data continuously since then.
- Accelerometers (ACC):
  - Following the GF2 OBC-B switchover, the GF2 Accelerometer was successfully powered on again Feb. 28, 2019 and by default powered up in Large Range Mode (LRM). LRM data will be evaluated by the SDS team to gain additional insight into its performance before transitioning the unit to the Nominal Range Mode (NRM).
- Laser Ranging Interferometer:
  - On Mar-18, 2019, the GF2 LRI was restarted following the OBC-B switchover. The LRI-link between GF1 and GF2 and nominal LRI data collection resumed shortly thereafter.
- Flight system operations:

The SDS is currently evaluating Attitude and Orbit Control System (AOCS) settings to improve the observations of the AOCS-related non-gravitational by the accelerometer. Between Nov. 14/15, 2018 and Feb. 7, 2019, an optimized AOCS setting was adopted on both GF1 and GF2 (1 sec roll-thrust duration). Since the OBC-related attitude safe mode, both satellites are currently operated



in the early IOC AOCS mode. Further AOCS fine-tuning will continue based on updated recommendations.

- Near-term plans:
  - In addition to the near-term activities mentioned above, the project is currently assessing plans to test and enable GPS radio occultation measurements on both spacecraft.
  - Additional AOCS fine-tuning to optimize ACC measurements and calibrations.
  - When to transition from LRM to NRM on GF2 is under consideration.

### **GRACE Follow-On: Orbit**

The GRACE Follow-On orbital parameters on Mar-19, 2019 were as follows:

Sun Beta (deg):	-20.7
Absolute Distance (km):	171.0
Drift (km/d):	-0.53
Mean Altitude (>6378.1 km):	491.1
Decay Rate (GF1/GF2) (7d mean, m/d):	1.8 / 1.9

On Mar-19, 2019, an orbit maneuver was executed on GF2 to reverse the drift.

### **Important Information for JPL PO.DAAC Users:**

NASA is in the process of deprecating the use of the FTP protocol for data and information access. PO.DAAC is pleased to offer PO.DAAC Drive as a robust FTP alternative for browsing and retrieving data at PO.DAAC (<https://podaac-tools.jpl.nasa.gov/drive/>). It offers file navigation and download through an interface served directly through your browser, and with a familiar look and feel. It also allows users to access data via a command line so that interactions can be easily scripted. The entire PO.DAAC archive can also be mounted to a local computer as a virtual data store.

### **Calendar & Upcoming Events:**

- EGU Annual Meeting 2019 (April 7-12, 2019, Vienna, Austria)
  - Check the meeting program for GRACE Follow-On and GRACE to find relevant presentations (<https://www.egu2019.eu/>)
- ESA Living Planet Symposium 2019 (May 13-17, 2019, Milan, Italy)
- IUGG 2019 (July 8-18, 2019, Montreal, Canada)
- 1<sup>st</sup> official GRACE-FO Level-1 A/B data release (May-28, 2019)
- 1<sup>st</sup> official GRACE-FO Level-2 release (no later than July-27, 2019)



- GRACE / GRACE-FO Science Team Meeting (Oct 8-10, 2019, Pasadena, CA, U.S.A.)

## **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](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](mailto:flechtne@gfz-potsdam.de)) or contact the JPL team via <https://grace.jpl.nasa.gov/about/feedback/>.