The following information details a change log for the JPL GRACE Mascon Solution.

The latest Mascon solution is RL06.3M, Version 4.0

Changes relevant for JPL RL06.3M Version 4.0

July 9, 2025: A bug was fixed that corrected a small error when the GAD was added back to the ocean portion of land/ocean mascons. The bug had resulted in a small error in the amount of mass that was added back in the GAD. The bug has been fixed, and any solution file that has a timeseries that extends beyond March 2025 will contain the fix.

August 26, 2024: JPL RL06.3M Version 4.0 is identical to JPL RL06.1M Version 3.0 with the exception that the ACX2 bundle for the accelerometer transplant is used in lieu of the ACX bundle. This change affects only months where the satellites are in wide dead band pointing, including: Jan/Feb 2023, and July 2023 - present. Constraints and solution strategy have not been changed. The calibration of 1-sigma uncertainty values during the GRACE-FO mission have been updated. This calibration primarily affects mascons that span land regions with low signal amplitudes.

Changes relevant for JPL RL06.1M Version 3.0

October 14, 2022: JPL RL06.1M Version 3.0 is identical to JPL RL06M Version 2.0 with the exception that the ACH1B data product is used in data processing rather than the ACT1B. The ACH1B is a hybrid accelerometer transplant data product. Constraints and solution strategy have not been changed.

December 6, 2023: TN-14v3 replaces TN-14v2 across the entire timeseries. A self-consistent geocenter derived using TN-14v3 is additionally used.

Changes relevant for JPL RL06M Version 2.0

August 25, 2021: Beginning with the release of June 2021, a bug was fixed affecting the change in gravity field parameterization going from July 2018 to June 2018. This bug-fix affects the backwards time correlation run, resulting in small changes in the GRACE mass change signals. Because the mascon solution is reported as anomalies relative to the 2004-2009 timeframe, differences in the released solution are seen most predominantly in the GRACE-FO data. The magnitude of the changes on the level of an individual mascon level predominantly lie within the formal uncertainty released with the data, however, there are excursions that eclipse the 1-sigma uncertainty. The affected mascons are predominantly located near ocean-ice sheet boundaries, however, the net mass change integrated over several adjacent mascons is not impacted.

September 2, 2020: Beginning with the release of July 2020, a bug was fixed where the GIA signal that is removed prior to implementing the CRI filter is now referenced to Jan. 1, 2008, which is the epoch of the static gravity field ggm05c used in the data processing. Prior to the bug fix, the GIA signal was erroneously referenced to Jan. 1, 2007 when removing it. This bug only affected the separation of land/ocean mass in mascons that span land/ocean boundaries. The overall effect on the solution was very small, with changes on an individual mascon level being well within the formal uncertainties released with the solution.

Changes from JPL RL06M Version 1.0 to JPL RL06M Version 2.0

Effective Date: 01/23/2020.

- For data releases containing months after September 2019, the initial conditions for the backwards time correlation run have been changed to be more closely aligned with the current state.

- Updated C20 replacement value to that given in TN-14. Previous releases used TN-11.

- Updated geocenter augmentation to be consistent with TN-13 processing standards. The background GRACE gravity field used in the computation of geocenter is the JPL Mascon data product, so the estimated geocenter is fully consistent with the solution.

- Slight relaxation of constraints over the ocean

- Modifed forward model of GIA over the ocean to include 17-year ocean mass trends as estimated from the JPL Mascon solution.

- Added GRACE-FO data to the solution record. Note the time correlation procedure implemented in solution process spans across both GRACE and GRACE-FO.

- Uncertainty computations for GRACE-FO months include additional uncertainty due to the lack of accelerometer data from GRACE-D. Note that this calibrated uncertainty is approximately 25% that of the GRACE months when there was only a single accelerometer available.

Users should note that the files describing the land mask, mascon placement, and scale factors have not changed from RL06M v01 to RL06M v02. They are equally applicable to both solutions.

Changes from JPL RL05M.1 Version 2.0 to JPL RL06M

Effective Date: 10/02/2018.

- Updated background force models and parameterizations. Details can be found in the L2 JPL Processing Standards document found here: ftp://podaac-ftp.jpl.nasa.gov/allData/grace/docs/L2-JPL_ProcStds_v6.0.pdf

- Onboard GPS data are now included in the solution (along with K-band range-rate data). As such, degree 2 and 3 harmonic coefficients no longer need to be replaced with those from the spherical harmonic solution, as was done in JPL RL05M.1.

- The GIA forward model over the ocean was changed to ICE-6GD (Peltier et al., 2016). This model is also now used to remove GIA prior to implementing the CRI filter, and this model is used to remove GIA signals in the official data release.

- The geocenter computation is still done based on Swenson et al. 2008; however, the input spherical harmonics field is changed to be JPL RL06.

- The initial apriori uncertainty for the time correlation run has been relaxed, and is now derived from the mascon solution itself, in an iterative procedure.

- Constraints over regions having experienced large earthquakes have been relaxed.

Users should note that the files describing the land mask, mascon placement, and scale factors have not changed from RL05M to RL06M. They are equally applicable to both solutions.

Changes from Version 1.0 to Version 2.0 in JPL RL05M.1 GRACE Mascon Solution.

Effective Date: 05/12/16.

- Initial apriori covariance was relaxed for Svalbard and the Russian Arctic.

- Fixed bug where C20 was not correctly replaced for Jan 2015.

- Implemented a forward model of ocean GIA signals using the GIA model (A. et al., 2013).

- The computation of the relative weighting between the data and apriori covariance was changed. The updated algorithm uses covariance information from the JPL spherical harmonic GRACE solution to identify months for which the gravity field is more poorly determined, thus necessitating higher weight to the apriori information.

- Geocenter is now being computed using in-house code at JPL. The algorithm is still based on Swenson et al., 2008.

- In version 1, ICE-6GC was used to remove GIA signals prior to implementing the CRI filter. In version 2, the GIA model (A. et al., 2013) is subtracted prior to implementing the CRI filter.

Changes from Version 1 to Version 2 of the CRI filter for the JPL RL05M.1 GRACE Mascon Solution.

Effective Date: 05/12/16.

- Turned the CRI filter "on" for all land/ocean mascons. Previously, it was turned off for mascons 168, 18, 4372, 4448, 4511, 4525, 4382, 4383, 4489, 4344, 4353, 73, 44, 41, 21, 20, 19, and 37.

Mascon locations can be found here:

ftp://podaac.jpl.nasa.gov/allData/tellus/L3/mascon/RL05/JPL/non-CRI/netcdf/JPL_MSCNv01_PLACEMENT.nc

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References:

1. A, G., J. Wahr, and S. Zhong (2013) Computations of the viscoelastic response of a 3-D compressible Earth to surface loading: an application to Glacial Isostatic Adjustment in Antarctica and Canada, Geophys. J. Int., 192, 557-572, doi: 10.1093/gji/ggs030.

2. Swenson S.C , D. P. Chambers, and J. Wahr: Estimating geocenter variations from a combination of GRACE and ocean model output. J Geophys. Res.-Solid Earth, Vol 113, Issue: B8, Article B08410. 2008.

3. Peltier, W. R., D. F. Argus, and R. Drummond (2018) Comment on the paper by Purcell et al. 2016 entitled An assessment of ICE-6G_C (VM5a) glacial isostatic adjustment model, J. Geophys. Res. Solid Earth, 122.

If you have any more questions, please visit our Forum: https://podaac.jpl.nasa.gov/forum/ .

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