

Aalborg Universitet

Impact of accelerometer calibration modelling on GRACE Follow-On precise orbit determination and intersatellite ranging

Papanikolaou, Thomas: Tsoulis, Dimitrios

Publication date: 2021

Document Version Publisher's PDF, also known as Version of record

Link to publication from Aalborg University

Citation for published version (APA):

Papanikolaou, T., & Tsoulis, D. (2021). Impact of accelerometer calibration modelling on GRACE Follow-On precise orbit determination and intersatellite ranging. Abstract from International Association of Geodesy (IAG) Scientific Assembly, Beijing, China.

https://www.researchgate.net/publication/352840826_Impact_of_accelerometer_calibration_modelling_on_GRA CE_Follow-On_precise_orbit_determination_and_intersatellite_ranging

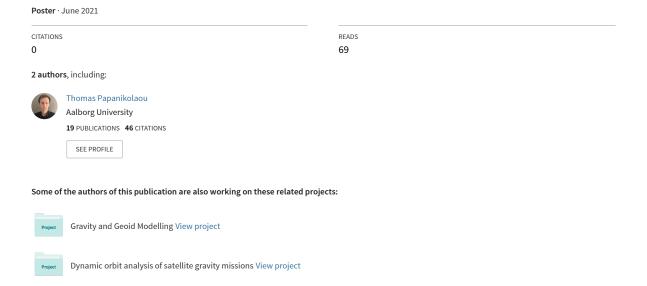
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
 You may freely distribute the URL identifying the publication in the public portal -

Take down policy
If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from vbn.aau.dk on: July 05, 2025

Impact of accelerometer calibration modelling on GRACE Follow-On precise orbit determination and intersatellite ranging





Scientific Assembly of the International Association of Geodesy



Impact of accelerometer calibration modelling on GRACE Follow-On precise orbit determination and intersatellite ranging

Thomas Papanikolaou¹, Dimitrios Tsoulis ²

¹Department of Planning, Aalborg University, Copenhagen, Denmark (thomasp@plan.aau.dk)

²Department of Geodesy and Surveying, Aristotle University of Thessaloniki, Greece

Precise orbit determination is a major objective in satellite geodesy and data analysis of several geoscientific satellite missions. Satellite gravity missions such as the Gravity Recovery And Climate Experiment (GRACE) missions (GRACE-FO and GRACE) are equipped with on-board accelerometers that form a key observation instrument for the measurement of non-gravitational perturbations at orbital altitude. The accelerometers calibration through a data processing scheme is essential for GRACE applications such as precise orbit determination, gravity field mapping and non-gravitational forces modelling.

The present study focuses on the estimation of the accelerometer calibration parameters within an orbit determination approach. We apply an adapted dynamic orbit determination algorithm with extended variational equations. The orbit parameter estimation considers accelerometry calibration parameters such as bias, drift and scale factors in combination with empirical forces of cycle-per-revolution (CPR) terms. The applied approach leads to orbit residuals within 2 to 4 cm (RMS) while the LRI and KBR rangerate data residuals vary within a few μ m/sec (RMS: GRACE-FO 1.7, GRACE 1.4 μ m/sec).

GRACE-FO/GRACE Orbit Determination and Accelerometer calibrate		it Determination and Accelerometer calibration modelling
	Orbit arc length / Date	1 day 18/7/2019 - 17/11/2009
	Earth Rotation	IERS Conventions 2010
	EOP	IERS 08 C04
	Numerical Integrator	Gauss-Jackson 12 th order; RKN7(6)-8 start integrator
	Integration step	2 sec / 5 sec
	Pseudo-Observations	Kinematic Orbit XYZ (Suesser-Rechberger et al. 2020)
	Gravity Model (d/o)	GOCO06s (Kvas et al. 2019)
	Planetary Ephemeris	DE423
	Solid Earth Tides	IERS Conventions 2010
	Ocean Tides	FES2004
	Relativistic effects	IERS Conventions 2010
	GRACE-FO Accelerometers	ACC1B, Full Scale matrix (9 parameters), Bias (XYZ), Bias drift (XYZ)
	GRACE Accelerometers	ACC1B, Diagonal Scale matrix (Sx,Sy,Sz), Bias (XYZ)
	Empirical Forces (GRACE-FO)	1-CPR (along & cross-track), Bias-along
	Intersatellite range-rate data	K-band ranging KBR1B & Laser Ranging Interferometry LRI1B

