João de Teixeira da Encarnação

Postdoctoral Fellow, Center for Space Research, University of Texas at Austin

Summary

João Encarnação is a researcher in the field of satellite geodesy. He has worked with different types of gravimetric data, focusing on understanding their error characteristics and how that influences the quality of the resulting gravity field models. He participated in numerous research projects involving international teams, which has allowed him to develop a wide and strong network (AT, CH, CZ, DE, NL, PT and US).

As a Postdoctoral Fellow at Center for Space Research (CSR), he is currently looking at ways to improve the calibration of GRACE accelerometer data and to predict the long-term trends in the GRACE gravity field models over the GRACE/GRACE Follow-on gap. Additionally, João Encarnação leads in informal cooperation between several European institutes for researching and promoting the gravity field models estimated from the GPS data gathered by the Swarm satellite mission. He also promotes the use of nano-satellites for collecting gravimetric data and, towards that end, is currently cooperating with Universidade do Minho and CSR to develop a MEMS-based micro accelerometer.

He has worked in different areas, including Structural Mechanics, Aerodynamics, Preliminary Vehicle Design, Single Stage to Orbit and Laser Propulsion, which have given him the opportunity to broaden his understanding of physics. João Encarnação is an avid programmer, actively learning new languages and techniques in order to better implement the algorithms and procedures required to develop his research. He openly shares the code he has developed in GitHub (https://github.com/jgte).

The html (http://jgte.github.io/cv/), PDF (http://jgte.github.io/cv/cv_jgte.pdf) and print-ready (http://jgte.github.io/cv/cv_jgte_print.pdf) versions this document are available on-line.

Personal Information

Full Name:	João Gregório de Teixeira da Encarnação
Birth:	25^{th} of February 1977 at Funchal, Portugal
Nationality:	Portuguese
Address:	3925 W Braker Lane Ste 200 - WPR 2.9076 Austin TX 78759-5316 USA
Telephone:	+1 (512) 232-6897
Email:	teixeira@csr.utexas.edu
Web:	University of Texas (https://directory.utexas.edu/index.php?q=joao+encarnacao), LinkedIn (http://nl.linkedin.com/in/joaoencarnacao), ResearchGate (https://www.researchgate.net/profile/Joao_Encarnacao2), Google Scholar (https://scholar.google.com/citations?user=k2liFwQAAAAJ), ORCID (http://orcid.org/0000-0001-6824-2733), Mendeley (https://www.mendeley.com/profiles/joao-encarnacao4/), SCOPUS (https://www.scopus.com/authid/detail.uri?authorId=15135565900), Publons (https://publons.com/a/782170/), GitHub (https://github.com/jgte)

Education

2015 PhD in Space Geodesy
Geoscience & Remote Sensing (http://tinyurl.com/GRS-TUDelft), Delft University of Technology (http://www.tudelft.nl/)
Dissertation: Next-generation satellite gravimetry for measuring mass transport in the Earth system (http://tinyurl.com/SatGrav)
Promotor: Prof. Dr.-Ing. habil. Roland Klees (http://tinyurl.com/ProfKlees)
Supervisor: dr.ir. Pavel Ditmar (http://tinyurl.com/DrDitmar)

2004 Master of Sciences in Aerospace Engineering
Astrodynamics and Space Missions (http://www.as.lr.tudelft.nl), Delft University of Technology (http://www.tudelft.nl/)
Final Thesis: Numerical Simulation of Launch Vehicles
Supervisor: Prof.ir. B.A.C. Ambrosius (http://tinyurl.com/ProfAmbrosius)

2000 Licenciatura in Aerospace Engineering
Instituto Superior Técnico (http://www.ist.utl.pt/), Technical University of Lisbon (http://www.utl.pt/)
5^{th} year concluded at Delft University of Technology, through the ERASMUS program
Report: Optimum Aerodynamic Shape for a High Altitude Long Endurance Aerostatic Platform
Supervisor: Prof. Dr. Ir. Theo van Holten

Academic and Research Experience

Aug. 2016 – present — Research Associate
Center for Space Research (http://www.csr.utexas.edu), Texas University at Austin (http://www.utexas.edu)
Austin, Texas, USA:
• Improvements in the calibration of the accelerometers on-board the GRACE satellites, in particular in what relates to temperature effects;
• Determination of the (non-linear) long-term trends in the GRACE gravity field solutions and their prediction during the GRACE/GRACE-FO gap.

Sep. 2011 – Jul. 2016 — Research Associate
Astrodynamics and Space Missions (http://www.as.lr.tudelft.nl), Delft University of Technology (http://www.tudelft.nl/)
Delft, the Netherlands:
• Calibration of the accelerometers on-board the Swarm satellites;
• Improvements in the modelling of non-conservative forces acting on satellites;
• Exploiting signal-processing techniques to merge the measurement of non-gravitational accelerations from different sources (GPS-driven and accelerometer observations);
• In-house software development in Fortran, Matlab and Ruby;
• Research project: Assessment of Satellite Constellations for Monitoring the Variations in Earth's Gravity Field;
• Research project: GOCE+ Theme3: Air density and wind retrieval using GOCE data;
• Research project: Development of the Swarm Level 2 Algorithms and Associated Level 2 Processing Facility;
• Student supervision and mentoring.

Jan. 2007 – Dec. 2015	PhD Candidate Geoscience & Remote Sensing (http://tinyurl.com/GRS-TUDelft), Delft University of Technology (http://www.tudelft.nl/) Delft, the Netherlands: • Simulation of future gravimetric satellite missions; • Research project: Assessment of a Next Generation Gravity Mission for Monitoring the Variations of Earth's Gravity Field; • Research project: Monitoring and Modelling Individual Sources of Mass Distribution and Transport in the Earth System by Means of Satellites; • In-house software development of in Fortran and Matlab; • Student supervision and mentoring.
Apr. 2005 – Nov. 2006	Stress Engineer Global Technics (http://www.globaltechnics.nl/) Leiden, the Netherlands: • Automated design (for weight and stress minimization) of fuselage panels for the Airbus A380 aircraft (in-house implementation of a tool in C++); • Trainees supervision and mentoring.
Oct. 2004 – Jan. 2005	Aerospace Engineer Delta-Utec (http://www.delta-utec.com/) Leiden, the Netherlands: • Contractor Work: Implementation of a Sub-Orbital Optimization Module into the Simulation Tool Colvet (developed in-house at TU Delft).
Mar. 2004 – Apr. 2004	Trainee Under the supervision of Ir. Berry Sanders, Rocket Technology Research Group Prins Maurits Laboratorium, TNO (http://www.tno.nl/), the Netherlands: • Numerical Simulations on Laser Propulsion (appendix of MSc thesis); • Collaboration with international colleagues (PT and NL) on a ESA (http://www.esa.int)-funded project to determine the feasibility of Laser Propulsion.
Sep. 2001 – Dec. 2001	Trainee Under the supervision of Prof. Wubbo Ockels (https://en.wikipedia.org/wiki/Wubbo_Ockels) European Space research and Technology Center (ESTEC) (http://www.esa.int/About_Us/ESTEC), ESA (http://www.esa.int) Noordwijk, the Netherlands: • Collaboration with fellow MSc colleagues on a space mission design project: Lunar Exploration with Ariane 5; • Simulation of rocket ascent trajectories (implemented a 2D orbit integrator in Matlab); • Optimization or rocket trajectories, thrust and attitude program, fuel consumption and payload; • Preliminary lunar mission design.

Collaborations

2016 – present International collaboration with Prof. Luis Rocha of Universidade do Minho (https://www.uminho.pt/EN) and Dr. Dae Lee of the Center for Space Research (http://www.csr.utexas.edu), Texas University at Austin (http://www.utexas.edu) for the **development of a Microelectromechanical systems-based space accelerometer as a first step towards the nano-gravimetric satellite framework**.

2015 – present International collaboration with Prof. Torsten Mayer-Gürr of the Institute of Geodesy (http://www.itsg.tugraz.at) of the Graz University of Technology (http://www.tugraz.at), Dr. Aleš Bezděk of the Astronomical Institute (http://www.asu.cas.cz/en) of the Academy of Sciences of the Czech Republic (http://www.cas.cz/index.html), Prof. Adrian Jäggi of the Astronomical Institute of the University of Bern (http://www.aiub.unibe.ch), Prof. Pieter Visser of the Aerospace Faculty (http://www.lr.tudelft.nl) of the Delft University of Technology (http://www.tudelft.nl) and Prof. C.K. Shum of the School of Earth Sciences (https://earthsciences.osu.edu) of the Ohio State University (https://www.osu.edu) for the **study of the time-variable gravity field of the Earth estimated from GPS data collected by the Swarm Satellite mission (**https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/swarm**)**. Within the scope of this project, we submitted a grant application with very positive reviews (Ref. ESA AO/1-7927/14/NL/MP), and have recently been awarded funding under the ITT posted by the ESA (http://www.esa.int)-funded DISC consortium (http://tinyurl.com/SwarmGrav)

2014 – present Collaboration with Delft University of Technology (http://www.tudelft.nl) on the DopTrack project (http://doptrack.tudelft.nl), consisting of a **satellite tracking radio station that exploits the Doppler effect**; co-initiated and promoted the project, secured departmental funding, selected and assembled the hardware, developed software, engaged students and mentored practical undergraduate projects.

Skills

Communication:	• Invited talk (http://tinyurl.com/h928s3c) at the American Geophysical Union Fall Meeting in 2015 (http://fallmeeting.agu.org/2015/) • Invited lecture at the Summer School on Data Assimilation and its applications in Oceanography, Hydrology, Risk & Safety and Reservoir Engineering in 2017 (http://data-assimilation.com) • Numerous presentations of research results (8 oral and 4 poster)
Teaching:	• Student supervision in the context of individual and group assignments • Introductory lectures to the practical projects
Theoretical:	• Parametric inversion • Statistical analysis • Stochastic modelling • Spherical harmonic functions • Digital signal processing • Coordinate transformations/quaternion arithmetic • Fourier analysis
Computational:	• Algorithm development and implementation • Data management, analysis and visualisation • Automation, robustness, fault recovery • Problem resolution/solution discovery/hacking
Software:	Latex, MS Office, Git, SVN
Articles review:	Successfully completed the review of 8 scientific articles cf. Publons (https://publons.com/a/782170/)
Operating Systems:	OSX, MS Windows, Unix/Linux
Programming:	1996 – present: Bash 1998 – present: MATLAB 2002 – present: FORTRAN 2006 – 2008: C/C++ 2011 – present: Ruby 2015 – present: Python

Fields of Interest

Big data
Geophysics
Digital signal processing
Numerical Simulation
Rocket Motion and Orbital Mechanics
Preliminary Vehicle Design
Aerodynamics
Structural Mechanics

Research Projects

2013 – 2015	Assessment of Satellite Constellations for Monitoring the Variations in Earth's Gravity Field (ESA contract 4000108663/13/NL/MV)
2013	GOCE+ Theme3: Air density and wind retrieval using GOCE data (ESA contract 400010284/11/NL/EL)

2011 – 2016	Development of the Swarm Level 2 Algorithms and Associated Level 2 Processing Facility (ESA Contract 4000102140/10/NL/JA)
2010	Assessment of a Next Generation Gravity Mission for Monitoring the Variations of Earth's Gravity Field (ESTEC contract 22643/09/NL/AF)
2008	Monitoring and Modelling Individual Sources of Mass Distribution and Transport in the Earth System by Means of Satellites (ESA contract 20403)

Languages

	Speaking	Reading	Writing
Portuguese		mother tongue	
English[a]	excellent	excellent	excellent
Spanish	good	good	fair
Italian	good	good	fair
Dutch	fair	fair	limited
French	fair	fair	limited

[a] holder of the Certificate of Proficiency in English (http://www.cambridgeenglish.org/exams/proficiency/index.aspx)

Sports

1991 – 2009	Basketball
April 2006	Finalist of the 26th International Fortis Marathon of Rotterdam (http://www.fortismarathonrotterdam.nl/)
September 2016 - present	Sailing

Other Activities

1991 – 2001	Scout at the 92^{nd} Scout-group of the Association of Portuguese Escoteiros (http://www.aep.pt)
1993 – present	Radio Amateur, call sign CT3IU, class B

Publications

de Teixeira da Encarnação, **João**, Daniel Arnold, Ales Bezdek, Christoph Dahle, Eelco Doornbos, Jose van den IJssel, Adrian Jäggi, Torsten Mayer-Gürr, Josef Sebera, Pieter Visser, et al. (2017). "Gravity field models derived from Swarm GPS data". In: *EGU General Assembly Conference Abstracts*. Vol. 19, p. 9218.

Bezděk, Aleš, Josef Sebera, **João de Teixeira da Encarnação**, and Jaroslav Klokočnı'k (2016). "Time-variable gravity fields derived from GPS tracking of Swarm". In: *Geophysical Journal International* 205.3, pp. 1665–1669.

de Teixeira da Encarnação, **João**, Daniel Arnold, Aleš Bezděk, Christoph Dahle, Eelco Doornbos, Jose van den IJssel, Adrian Jäggi, Torsten Mayer-Gürr, Josef Sebera, Pieter Visser, et al. (2016a). "Gravity field models derived from Swarm GPS data". In: *Earth, Planets and Space* 68.1, p. 127.

de Teixeira da Encarnação, **João**, Daniel Arnold, Ales Bezdek, Christoph Dahle, Eelco Doornbos, Jose van den IJssel, Adrian Jäggi, Torsten Mayer-Gürr, Josef Sebera, Pieter Visser, et al. (2016b). "Gravity field models derived from Swarm GPS data". In: *EGU General Assembly Conference Abstracts*. Vol. 18, p. 5967.

Doornbos, Eelco, **João de Teixeira da Encarnação**, Jose van den IJss, Christian Siemes, Ludwig Grunwaldt, Radek Peresty, Jiri Kraus, Jakob Flury, Guy Apelbaum, and Poul Erik Holmdahl Olsen (2016). "Thermospheric neutral densities derived from Swarm accelerometer and GPS data". In: *ESA Living Planet Symposium 2016*.

Jäggi, Adrian, Ulrich Meyer, Yoomin Jean, Andrea Susnik, Rolf Dach, Matthias Weigelt, Tonie van Dam, Zhao Li, Qiang Chen, Frank Flechtner, et al. (2016). "European Gravity Service for Improved Emergency Management–Status and Project Highlights". In: *International Association of Geodesy Symposia*. Springer, p. 1.

Siemes, Christian, **João de Teixeira da Encarnação**, Eelco Doornbos, Jose IJssel, Jiřı' Kraus, Radek Pereštý, Ludwig Grunwaldt, Guy Apelbaum, Jakob Flury, and Poul Erik Holmdahl Olsen (2016). "Swarm accelerometer data processing from raw accelerations to thermospheric neutral densities". In: *Earth, Planets and Space* 68.1, p. 92.

Siemes, Christian, Ludwig Grunwaldt, Radek Peresty, Jiri Kraus, Eelco Doornbos, **João de Teixeira da Encarnação**, Jose van den IJssel, Jakob Flury, Guy Apelbaum, and Poul Erik Holmdahl Olsen (2016). "Improvements of the Swarm Accelerometer Data Processing". In: *ESA Living Planet Symposium 2016*.

Astafyeva, E, I Zakharenkova, M Foerster, E Doornbos, **João de Teixeira da Encarnação**, and C Siemes (2015). "Ionospheric and Thermospheric Response to the 2015 St. Patrick's Day Storm: a Global Multi-Instrumental Overview". In: *AGU Fall Meeting Abstracts*.

de Teixeira da Encarnação, **João**, P Ditmar, and R Klees (2015). "Impact of Orbit Position Errors on Future Satellite Gravity Models". In: *AGU Fall Meeting Abstracts*.

de Teixeira da Encarnação, **João**, A Jaeggi, C Dahle, D Arnold, A Bezdek, J Sebera, T Mayer-Gürr, N Zehentner, PN Visser, E Doornbos, et al. (2015). "First monthly gravity field solutions derived from GPS orbits of Swarm". In: *AGU Fall Meeting Abstracts*.

Doornbos, E, C Siemes, **João de Teixeira da Encarnação**, R Perestý, L Grunwaldt, J Kraus, PE Holmdahl Olsen, J van den IJssel, J Flury, and G Apelbaum (2015). "Processing of Swarm Accelerometer Data into Thermospheric Neutral Densities". In: *AGU Fall Meeting Abstracts*.

Van Den IJssel, Jose, **João de Teixeira da Encarnação**, Eelco Doornbos, and Pieter Visser (2015). "Precise science orbits for the Swarm satellite constellation". In: *Advances in Space Research* 56.6, pp. 1042–1055.

Bruinsma, S, E Doornbos, C Siemes, R Perestý, J Kraus, A Bezdek, J van den IJssel, **João de Teixeira da Encarnação**, and PN Visser (2014). "Results from the First Year of Swarm GPS Receiver and Accelerometer Data." In: *AGU Fall Meeting Abstracts*. Vol. 1, p. 02.

Doornbos, E, S Bruinsma, B Fritsche, P Visser, J Van Den IJssel, **João de Teixeira da Encarnação**, and M Kern (2013). "Air density and wind retrieval using GOCE data". In: *ESA Special Publication*. Vol. 722, p. 7.

Friis-Christensen, Eigil and Rune Floberghagen (2013). "Preface". In: *Earth, Planets and Space* 65.11, pp. 1185–1187.

Hashemi Farahani, H, P Ditmar, R Klees, **João de Teixeira da Encarnação**, X Liu, Q Zhao, and J Guo (2013). "Validation of static gravity field models using GRACE K-band ranging and GOCE gradiometry data". In: *Geophysical Journal International* 194.2, pp. 751–771.

Olsen, Nils, Eigil Friis-Christensen, Rune Floberghagen, Patrick Alken, Ciaran D Beggan, Arnaud Chulliat, Eelco Doornbos, **João de Teixeira da Encarnação**, Brian Hamilton, Gauthier Hulot, et al. (2013). "The Swarm satellite constellation application and research facility (SCARF) and Swarm data products". In: *Earth, Planets and Space* 65.11, pp. 1189–1200.

Visser, Pieter, Eelco Doornbos, Jose van den IJssel, and **João de Teixeira da Encarnação** (2013). "Thermospheric density and wind retrieval from Swarm observations". In: *Earth, Planets and Space* 65.11, pp. 1319–1331.

Ditmar, Pavel, **João de Teixeira da Encarnação**, and Hassan Hashemi Farahani (2012). "Understanding data noise in gravity field recovery on the basis of inter-satellite ranging measurements acquired by the satellite gravimetry mission GRACE". In: *Journal of Geodesy* 86.6, pp. 441–465.

Doornbos, E, S Bruinsma, G Koppenwallner, B Fritsche, J van den IJssel, P Visser, **João de Teixeira da Encarnação**, and M Kern (2012). "Thermospheric density and wind from GOCE thruster activation and accelerometer data". In: *EGU General Assembly Conference Abstracts*. Vol. 14, p. 5634.

Gunter, BC, **João de Teixeira da Encarnação**, P Ditmar, and R Klees (2012). "Potential contributions to space geodesy from the IridiumNEXT constellation". In: *AGU Fall Meeting Abstracts*. Vol. 1, p. 01.

Gunter, B.C., **João de Teixeira da Encarnação**, P. Ditmar, R. Klees, P.W.L. van Barneveld, and P. Visser (2012). "Deriving Global Time-Variable Gravity from Precise Orbits of the Iridium NEXT Constellation". In: *AAS/AIAA Astrodynamics Specialist Conference, Alaska, USA*. American Astronautical Society.

Anselmi, A., S. Cesare, P.N.A.M. Visser, T. van Dam, N. Sneeuw, T. Gruber, B. Altés, F. Cossu, P. Ditmar, M. Murböck, et al. (2011). *Assessment of a Next Generation Gravity Mission for Monitoring the Variations of Earth's Gravity*.

Gunter, B, **João de Teixeira da Encarnação**, P Ditmar, and R Klees (2011). "An investigation into new advances in geodesy utilizing future satellite constellations". In: *AGU Fall Meeting Abstracts*. Vol. 1, p. 03.

Gunter, Brian C, **João de Teixeira da Encarnação**, Pavel Ditmar, and Roland Klees (2011). "Using satellite constellations for improved determination of Earth's time-variable gravity". In: *Journal of Spacecraft and Rockets* 48.2, pp. 368–377.

Olsen, N, P Alken, C Beggan, A Chulliat, E Doornbos, R Floberghagen, EA Friis-Christensen, B Hamilton, G Hulot, J van den IJssel, et al. (2011). "SCARF-The Swarm Satellite Constellation Application and Research Facility". In: *AGU Fall Meeting Abstracts*. Vol. 1, p. 0980.

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Gunter, Brian C., **João de Teixeira da Encarnação**, and Pavel Ditmar. (2009). "The Use of Satellite Constellations and Formations for Future Satellite Gravity Missions". In: *Advances in the Astronautical Sciences*. www.univelt.com/book=1451, pp. 1357–1368.

Gunter, Brian C, Pavel Ditmar, and **João de Teixeira da Encarnação** (2009). "THE DETERMINATION OF TIME-VARIABLE GRAVITY FROM A CONSTELLATION OF NON-DEDICATED SATELLITES". In: *Advances in the Astronautical Sciences* 135.3, pp. 1999–2007.

de Teixeira da Encarnação, João, P. Ditmar, and X. Liu (2008). "Analysis of Satellite Formations in the Context of Gravity Field Retrieval". In: *The 3rd International Symposium on Formation Flying, Missions and Technologies*. European Space Agency.

de Teixeira da Encarnação, João, R Klees, E Zapreeva, P Ditmar, and J Kusche (2008). "Influence of hydrology-related temporal aliasing on the quality of monthly models derived from GRACE satellite gravimetric data". In: *Observing our Changing Earth*, pp. 323–328.

Resendes, David P, Sérgio Mota, José T Mendonça, Berry Sanders, **João de Teixeira da Encarnação**, and Jose Gonzalez Del Amo (2007). "Laser propulsion for ground launch". In: *Journal of Propulsion and Power* 23.1, pp. 73–80.

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Resendes, David P, Sérgio Mota, José T Mendonça, Berry Sanders, **João de Teixeira da Encarnação**, and Jose Gonzalez del Amo (2005). "Laser Propulsion for Ground to Orbit Launch". In: *29th International Electric Propulsion Conference*.

de Teixeira da Encarnação, João and W.J. Ockels (2002). "Single Stage To Orbit Minimum Requirements Through Numerical Simulation". In: *53rd International Astronautical Congress*.

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Referees

Prof. Byron Tapley (Research advisor), Center for Space Research of the University of Texas at Austin, +1 512 471 5573, tapley@csr.utexas.edu

Prof. Pieter Visser (Research advisor), Astrodynamics and Satellite Missions Group of the Delft University of Technology, +31 15 27 82595, P.N.A.M.Visser@tudelft.nl

Dr. Pavel Ditmar (PhD advisor), Geosciences and Remote Sensing of the Delft University of Technology, +31 15 27 82501, p.g.ditmar@tudelft.nl

Prof. Boudewijn Ambrosius (MSc advisor), Astrodynamics and Satellite Missions Group of the Delft University of Technology, B.A.C.Ambrosius@tudelft.nl