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, 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 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.

The html, PDF and print-ready versions this document are available on-line.

Personal Information

Full Name:	João Gregório de Teixeira da Encarnação
Birth:	25th of February 1977 at Funchal, Portugal
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	Publons
	GitHub

Education

2015	PhD in Space Geodesy Geoscience & Remote Sensing, Delft University of Technology Dissertation: Next-generation satellite gravimetry for measuring mass transport in the Earth system Promotor: Prof. Dr.-Ing. habil. Roland Klees Supervisor: dr.ir. Pavel Ditmar
2004	Master of Sciences in Aerospace Engineering Astrodynamics and Space Missions, Delft University of Technology Final Thesis: Numerical Simulation of Launch Vehicles Supervisor: Prof.ir. B.A.C. Ambrosius
2000	Licenciatura in Aerospace Engineering Instituto Superior Técnico, Technical University of Lisbon 5th 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

Work Experience

Aug. 2016 – present	Research Associate Center for Space Research, Texas University at Austin Austin, Texas, USA
Sep. 2011 – Jul. 2016	Research Associate Astrodynamics and Space Missions, Delft University of Technology Delft, the Netherlands
Jan. 2007 – Dec. 2015	PhD Candidate Geoscience & Remote Sensing, Delft University of Technology Delft, the Netherlands
Apr. 2005 – Nov. 2006	Stress Engineer Global Technics Leiden, the Netherlands
Oct. 2004 – Jan. 2005	Aerospace Engineer Implementation of a Sub-Orbital Optimization Module into the Simulation Tool Colvet (Contractor Work) Delta-Utec Leiden, the Netherlands
Mar. 2004 – Apr. 2004	Trainee Numerical Simulations on Laser Propulsion (appendix of MSc thesis) Under the supervision of Ir. Berry Sanders, Rocket Technology Research Group Prins Maurits Laboratorium, TNO, the Netherlands
Sep. 2001 – Dec. 2001	Trainee Lunar Exploration with Ariane 5 Under the supervision of Prof. Wubbo Ockels European Space research and Technology Center (ESTEC), European Space Agency (ESA) Noordwijk, the Netherlands

Skills

Leadership:	• Established and manages the cooperation between four European institutes: Institute of Geodesy of the Graz University of Technology, Astronomical Institute of the Academy of Sciences of the Czech Republic, Astronomical Institute of the University of Bern Aerospace Faculty of the Delft University of Technology and School of Earth Sciences of the Ohio State University for the **study of the time-variable gravity field of the Earth retrieved from GPS data from the Swarm Satellite mission**, leading to a previous grant application with very positive reviews (Ref. ESA AO/1-7927/14/NL/MP), and response to the ITT posted by the ESA-funded DISC consortium (on-going)
	• Co-initiated the DopTrack project consisting of a **satellite tracking radio station that exploits the Doppler effect**; promoted the project, secured departmental funding, selected and assembled the hardware, developed software, engaged students and mentored practical undergraduate projects.
Communication:	• Invited talk at the American Geophysical Union Fall Meeting in 2015 • Invited lecture at the Summer School on Data Assimilation and its applications in Oceanography, Hydrology, Risk & Safety and Reservoir Engineering in 2017 • 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
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

Satellite accelerometry	• Combination of orbit-derived non-gravitational accelerations with accelerometer observations in the context of the Swarm satellite mission
Space Geodesy	• Gravity field models from Swarm kinematic orbits • Impact of orbit position errors in the quality of gravimetric data from satellite formations • Noise budget of low-low satellite-to-satellite tracking gravimetric data • Retrieval of the high-frequency time-variable gravity field of the Earth with numerous satellites
Laser Propulsion	• Use of ground-based lasers to launch small satellites to orbit
Single Stage to Orbit	• Determination of the minimum technological requirements for a single stage to orbit launcher

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

Publications

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

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de Teixeira da Encarnação, João, Daniel Arnold, Aleš Bezděk, Christoph Dahle, Eelco Doornbos, Jose IJssel, Adrian Jäggi, Torsten Mayer-Gürr, Josef Sebera, Pieter Visser, et al. (2016b). "Gravity field models derived from Swarm GPS data". In: *Earth, Planets and Space* 68.1, p. 1.

Siemes, Christian, **João de Teixeira da Encarnação**, Eelco Doornbos, Jose IJssel, Jiř' Kraus, Radek Perestý, 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. 1.

de Teixeira da Encarnação, João (2015). "Impact of Orbit Position Errors on Future Satellite Gravity Models". In: *2015 AGU Fall Meeting*. Agu.

de Teixeira da Encarnação, João, Daniel Arnold, Aleš Bezdek, Christoph Dahle, Eelco Doornbos, Jose van den IJssel, Adrian Jäggi, Torsten Mayer-Gürr, Josef Sebera, Pieter Visser, et al. (2015). "First monthly gravity field solutions derived from GPS orbits of Swarm". In: *2015 AGU Fall Meeting*. Agu.

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, Sean, 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.

Farahani, H Hashemi, 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.

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

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 Irid-

ium 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.

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Ditmar, Pavel, Hassan Hashemi Farahani, and **João de Teixeira da Encarnação** (2010). "Mitigation of along-track artifacts in unconstrained mass transport models based on GRACE satellite data". In: *EGU General Assembly Conference Abstracts*. Vol. 12, p. 10393.

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Hashemi Farahani, H, P Ditmar, **João de Teixeira da Encarnação**, and X Liu (2010). "Contribution of an accurate determination of GRACE satellite orbits to precise mass transport modeling". In: *EGU General Assembly Conference Abstracts*. Vol. 12, p. 10867.

de Teixeira da Encarnação, **João**, R Klees, E Zapreeva, P Ditmar, and J Kusche (2009). "Influence of hydrology-related temporal aliasing on the quality of monthly models derived from GRACE satellite gravimetric data". In: *Observing our Changing Earth*. Springer Berlin Heidelberg, pp. 323–328.

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.

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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.

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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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