

Vanderlei C. Oliveira Jr.


Associate Professor of Geophysics

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OVERVIEW

Associate Professor at the geophysics department of Observatório Nacional, Brazil. Specialist in developing numerical methods for processing and interpreting potential fields (gravity and magnetic).

APPOINTMENTS

Associate Professor of Geophysics

2017–

Observatório Nacional, Rio de Janeiro, Brazil

Assistant Professor of Geophysics

2013–2016

Observatório Nacional, Rio de Janeiro, Brazil

RESEARCH INTERESTS

- **Equivalent layer technique:** computationally efficient methods for processing and interpreting large potential field data sets.
- **Inversion of gravity and/or magnetic data:** methods to invert gravity and/or magnetic data for the purpose of estimating the position and shape of geological bodies.
- **Magnetization of geological bodies:** methods for estimating the magnetization direction of geological bodies by using land and airborne magnetic data.
- **Magnetization of rock samples:** methods for estimating the magnetization distribution within rock samples by using scanning magnetic microscopy data.
- **Magnetic modelling of geological bodies:** methods for computing the demagnetizing field within geological bodies having high susceptibility.
- **Regional characterization of gravity field:** computationally efficient methods for representing the regional gravity field by combining different data sets.
- **Regional characterization of the crustal magnetic field:** computationally efficient methods for representing the crustal field by combining different data sets.

EDUCATION

PhD Geophysics

Dec/2010 – Jan/2013

Observatório Nacional, Brazil

Title (portuguese): “Processamento e inversão de dados de campos potenciais: Novas abordagens”

Title (english): “Processing and inversion of potential field data: New approaches”

Advisor: Dr. Valeria C. F. Barbosa

Description: This work presents two new methodologies for processing and interpreting potential field data. The first one is the Polynomial Equivalent Layer, which is a cost-effective method for processing large potential-field data sets via the equivalent-layer technique. The second is a non-linear method for inverting gravity-gradient data to estimate the shape of isolated 3-D geological bodies.

MSc Geophysics

Mar/2009 – Nov/2010

Observatório Nacional, Brazil

Title (portuguese): “Inversão gravimétrica radial por camadas para a reconstrução de corpos geológicos 3D”

Title (english): “Radial gravity inversion by layers for retrieving 3D geological bodies”

Advisor: Dr. Valeria C. F. Barbosa

Description: This work presents a gravity-inversion method for estimating the geometry of a 3D source. The subsurface region containing the geologic source is discretized into an ensemble of vertically juxtaposed prisms. By estimating the coordinates of the horizontal section of each prism, the method retrieves a set of polygonal horizontal sections representing depth slices of the 3D gravity source.

BSc Geophysics

Mar/2004 – Dec/2008

University of São Paulo, Brazil

Title (portuguese): “Modelagem gravimétrica 3D da borda norte da Bacia do Paraná”

Title (english): “3D gravity modelling of the northern border of the Paraná basin”

Advisor: Dr. Yara R. Marangoni

Description: This work presents a geological model of the northern border of the Paraná basin obtained from gravity data.

PEER-REVIEWED JOURNAL PAPERS ([ORCID](#))

- [1] Siqueira, F. C. L., Oliveira Jr., V. C., and Barbosa, V. C. F. Fast iterative equivalent-layer technique for gravity data processing: A method grounded on excess mass constraint. *GEOPHYSICS*, 82(4):G57–G69, 2017. doi:10.1190/geo2016-0332.1.
- [2] Takahashi, D. and Oliveira Jr., V. C. Ellipsoids (v1.0): 3-D magnetic modelling of ellipsoidal bodies. *Geoscientific Model Development*, 10(9):3591–3608, 2017. ISSN 1991-9603. doi:10.5194/gmd-10-3591-2017.

- [3] Reis, A. L. A., Oliveira Jr., V. C., Yokoyama, E., Bruno, A. C., and Pereira, J. M. B. Estimating the magnetization distribution within rectangular rock samples. *Geochemistry, Geophysics, Geosystems*, 17(8):3350–3374, 2016. ISSN 15252027. doi:10.1002/2016GC006329.
- [4] Oliveira Jr, V., Sales, D., Barbosa, V., and Uieda, L. Estimation of the total magnetization direction of approximately spherical bodies. *Nonlinear Processes in Geophysics*, 22(2):215–232, 2015. doi:10.5194/npg-22-215-2015.
- [5] Uieda, L., Oliveira Jr., V. C., and Barbosa, V. C. F. Geophysical tutorial: Euler deconvolution of potential-field data. *The Leading Edge*, 33(4):448–450, 2014. ISSN 1070-485X, 1938-3789. doi:10.1190/tle33040448.1.
- [6] Melo, F. F., Barbosa, V. C. F., Uieda, L., Oliveira Jr., V. C., and Silva, J. B. C. Estimating the nature and the horizontal and vertical positions of 3d magnetic sources using Euler deconvolution. *GEOPHYSICS*, 78(6):J87–J98, 2013. ISSN 0016-8033, 1942-2156. doi:10.1190/geo2012-0515.1.
- [7] Oliveira Jr., V. C. and Barbosa, V. C. 3-D radial gravity gradient inversion. *Geophysical Journal International*, 195(2):883–902, 2013. ISSN 1365-246X, 0956-540X. doi:10.1093/gji/ggt307.
- [8] Oliveira Jr., V. C., Barbosa, V. C. F., and Uieda, L. Polynomial equivalent layer. *GEOPHYSICS*, 78(1):G1–G13, 2013. doi:10.1190/geo2012-0196.1.
- [9] Oliveira Jr., V. C., Barbosa, V. C. F., and Silva, J. B. C. Source geometry estimation using the mass excess criterion to constrain 3-D radial inversion of gravity data. *Geophysical Journal International*, 187(2):754–772, 2011. ISSN 0956540X. doi:10.1111/j.1365-246X.2011.05172.x.

THESES SUPERVISED

- 1. [MSc] Title (portuguese): “[Modelagem magnética 3D de corpos elipsoidais](#)”, Title (english): “3D Magnetic modeling of elipsoidal bodies”, Student: Diego Takahashi, *Observatório Nacional, Brazil* (2017).
- 2. [MSc] Title (portuguese): “[Inversão magnética 3D para estimar a distribuição de magnetização de uma amostra de rocha](#)”, Title (english): “3D Magnetic inversion to estimate the magnetization distribution of a rectangular rock sample”, Student: André L. A. Reis, *Observatório Nacional, Brazil* (2016).
- 3. [MSc] Title (portuguese): “[Estimativa do vetor de magnetização total de corpos aproximadamente esféricos](#)”, Title (english): “Estimating the total magnetization vector of approximately spherical bodies”, Student: Daiana P. Sales, *Observatório Nacional, Brazil* (2014).

THESES CO-SUPERVISED

- 1. [MSc] Title (portuguese): “Investigação geofísica do Alto do Ceará na margem equatorial brasileira – Uma crosta continental ou uma crosta oceânica?”, Title (english): “Geophysical investigation of the Ceará Rise in the brazilian equatorial margin – A continental crust or oceanic crust?”, Student: Victor C. Pereira, *Observatório Nacional, Brazil* (2017).

2. [PhD] Title (portuguese): “[Otimização computacional do método da camada equivalente](#)”, Title (english): “Computational optimization of the equivalent layer method”, Student: Fillipe C. L. Siqueira, *Observatório Nacional, Brazil* (2016).

TEACHING

- Graduate course: “Potential-field methods”, Graduation Program in Geophysics, *Observatório Nacional, Brazil*, 2014 – present
- Graduate course: “Computational methods applied to Geophysics”, Graduation Program in Geophysics, *Observatório Nacional, Brazil*, 2014 – present

PARTICIPATION IN DEPARTMENTAL COMMITTEES

- Member of the academic staff of the Graduate Program in Geophysics of the Observatório Nacional, 2014 – present
- Head of the academic staff of the Graduate Program in Geophysics of the Observatório Nacional, 2017 – present

FUNDING

- [Conselho Nacional de Desenvolvimento Científico e Tecnológico \(CNPq\)](#), Title (portuguese): “Estimativa da direção da magnetização total de corpos 3D aproximadamente esféricos”, Title (english): “Estimation of the total magnetization direction of approximately 3D spherical bodies”, ID: 445752/2014-9, R\$ 20 000.00, Nov/2014 – Nov/2017.
- [Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro \(FAPERJ\)](#), Title (portuguese): “Infraestrutura computacional para a estimação da magnetização de corpos 3D aproximadamente dipolares”, Title (english): “Computational infrastructure for estimating the magnetization direction of approximately dipolar bodies”, ID: E-26/111.152/2014, R\$ 10 000.00, Jun/2014 – Mar/2016.