# Vanderlei C. Oliveira Jr.

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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

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| **Associate Professor of Geophysics**<br>*Observatório Nacional, Rio de Janeiro, Brazil* | 2017– |
| **Assistant Professor of Geophysics**<br>*Observatório Nacional, Rio de Janeiro, Brazil* | 2013–2016 |

## 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 combining different data sets

- **Regional characterization of the crustal magnetic field:** computationally efficient methods for 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
**Descritpion:** 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
**Descritpion:** 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
**Descritpion:** 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.