












CONTACT INFORMATION

 **Vanderlei C. Oliveira Jr.**
 *Observatório Nacional*
 *Rio de Janeiro - RJ, Brazil*
 vanderlei@on.br
 github.com/birocoles
 pinga-lab.org/people/oliveira-jr.html
 lattes.cnpq.br/4332841435949533
 orcid.org/0000-0002-6338-4086
 publons.com/researcher/1454914/oliveira-jr-v-c/
 impactstory.org/u/0000-0002-6338-4086
 researchgate.net/profile/Vanderlei-Oliveira-Jr



OVERVIEW

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

APPOINTMENTS

Full Professor of Geophysics <i>Observatório Nacional, Brazil</i>	2020–present
Associate Professor of Geophysics <i>Observatório Nacional, Brazil</i>	2016–2020
Assistant Professor of Geophysics <i>Observatório Nacional, Brazil</i>	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 modeling 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.
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EDUCATION

PhD Geophysics

Observatório Nacional, Brazil

Dec/2010 – Jan/2013

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. Valéria 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

Observatório Nacional, Brazil

Mar/2009 – Nov/2010

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. Valéria 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

University of São Paulo, Brazil

Mar/2004 – Dec/2008

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. Yára 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) L. B. Vital, V. C. Oliveira Jr., and V. C. F. Barbosa. Magnetic radial inversion for 3-D source geometry estimation. *Geophysical Journal International*, 05 2021. ISSN 0956-540X. doi: 10.1093/gji/ggab195
- (2) F. F. Melo, S. P. Gonzalez, V. C. Barbosa, and V. C. Oliveira Jr. Amplitude of the magnetic anomaly vector in the interpretation of total-field anomaly at low magnetic latitudes. *Journal of Applied Geophysics*, 190:104339, 2021. ISSN 0926-9851. doi: 10.1016/j.jappgeo.2021.104339
- (3) M. C. Hidalgo-Gato, V. C. F. Barbosa, and V. C. Oliveira Jr. Magnetic amplitude inversion for depth-to-basement and apparent magnetization-intensity estimates. *Geophysics*, 86(1):J1–J11, 2021. doi: 10.1190/geo2019-0726.1
- (4) D. Takahashi, V. C. Oliveira Jr., and V. C. F. Barbosa. Convolutional equivalent layer for gravity data processing. *Geophysics*, 85(6):G129–G141, 2020. doi: 10.1190/geo2019-0826.1
- (5) A. L. A. Reis, V. C. Oliveira Jr., and V. C. F. Barbosa. Generalized positivity constraint on magnetic equivalent layers. *Geophysics*, 85(6):J99–J110, 2020. doi: 10.1190/geo2019-0706.1
- (6) V. P. Maurya, S. L. Fontes, V. C. Oliveira Jr., and E. F. La Terra. Gradient based first- and second-order filters for the demarcation of continental-oceanic boundaries using satellite gravity data. *Geophysical Journal International*, 221(3):1499–1514, 02 2020. ISSN 0956-540X. doi: 10.1093/gji/ggaa084
- (7) B. M. S. Bastos and V. C. Oliveira Jr. Isostatic constraint for 2D nonlinear gravity inversion on rifted margins. *Geophysics*, 85(1):G17–G34, 2020. doi: 10.1190/geo2018-0772.1
- (8) J. F. D. F. Araujo, A. L. A. Reis, A. A. P. Correa, E. Yokoyama, V. C. Oliveira Jr., L. A. F. Mendoza, M. A. C. Pacheco, C. Luz-Lima, A. F. Santos, F. G. Osorio G., G. E. Brito, W. W. R. Araujo, Tahir, A. C. Bruno, and T. Del Rosso. Scanning magnetic microscope using a gradiometric configuration for characterization of rock samples. *Materials*, 12(24), 2019. ISSN 1996-1944. doi: 10.3390/ma12244154
- (9) J. F. D. F. Araujo, A. L. A. Reis, V. C. Oliveira Jr., A. F. Santos, C. Luz-Lima, E. Yokoyama, L. A. F. Mendoza, J. M. B. Pereira, and A. C. Bruno. Characterizing complex mineral structures in thin sections of geological samples with a scanning hall effect microscope. *Sensors*, 19(7), 2019. ISSN 1424-8220. doi: 10.3390/s19071636
- (10) D. Takahashi and V. C. Oliveira Jr. Ellipsoids (v1.0): 3-D magnetic modelling of ellipsoidal bodies. *Geoscientific Model Development*, 10(9):3591–3608, 2017. doi: 10.5194/gmd-10-3591-2017
- (11) F. C. L. Siqueira, V. C. Oliveira Jr., and V. C. F. Barbosa. 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

- (12) A. L. A. Reis, V. C. Oliveira Jr., E. Yokoyama, A. C. Bruno, and J. M. B. Pereira. Estimating the magnetization distribution within rectangular rock samples. *Geochemistry, Geophysics, Geosystems*, 17(8):3350–3374, 2016. doi: 10.1002/2016GC006329
- (13) V. C. Oliveira Jr., D. P. Sales, V. C. F. Barbosa, and L. Uieda. 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
- (14) L. Uieda, V. C. Oliveira Jr., and V. C. F. Barbosa. Geophysical tutorial: Euler deconvolution of potential-field data. *The Leading Edge*, 33(4):448–450, 2014. doi: 10.1190/tle33040448.1
- (15) V. C. Oliveira Jr., V. C. F. Barbosa, and L. Uieda. Polynomial equivalent layer. *Geophysics*, 78(1):G1–G13, 2013. doi: 10.1190/geo2012-0196.1
- (16) F. F. Melo, V. C. F. Barbosa, L. Uieda, V. C. Oliveira Jr., and J. B. C. Silva. Estimating the nature and the horizontal and vertical positions of 3D magnetic sources using Euler deconvolution. *Geophysics*, 78(6):J87–J98, 2013. doi: 10.1190/geo2012-0515.1
- (17) V. C. Oliveira Jr. and V. C. Barbosa. 3-D radial gravity gradient inversion . *Geophysical Journal International*, 195(2):883–902, 09 2013. ISSN 0956-540X. doi: 10.1093/gji/ggt307
- (18) V. C. Oliveira Jr., V. C. F. Barbosa, and J. B. C. Silva. Source geometry estimation using the mass excess criterion to constrain 3-D radial inversion of gravity data. *Geophysical Journal International*, 187(2):754–772, 11 2011. ISSN 0956-540X. doi: 10.1111/j.1365-246X.2011.05172.x

INTERNATIONAL CONFERENCES

- (1) S. P. Gonzalez, V. C. F. Barbosa, and V. C. Oliveira Jr. Estimate of the remanent magnetization direction via equivalent layer. In *SEG Technical Program Expanded Abstracts 2020*, pages 969–973. SEG, 2020. doi: 10.1190/segam2020-3428268.1. [abstract co-author]
- (2) L. S. Piaulino, V. C. F. Barbosa, and V. C. Oliveira Jr. Fast equivalent-layer technique for magnetic data processing. In *SEG Technical Program Expanded Abstracts 2020*, pages 930–934. SEG, 2020. doi: 10.1190/segam2020-3428252.1. [abstract co-author]
- (3) D. Takahashi, V. C. Oliveira Jr., and V. C. F. Barbosa. Gravity data processing with a convolutional equivalent layer. In *SEG Technical Program Expanded Abstracts 2020*, pages 935–939. SEG, 2020. doi: 10.1190/segam2020-3426849.1. [abstract co-author]
- (4) F. F. Melo, S. P. Gonzalez, V. C. F. Barbosa, and V. C. Oliveira Jr. Amplitude of the magnetic anomaly vector for interpretation at low latitudes. In *SEG Technical Program Expanded Abstracts 2019*, pages 1744–1748, San Antonio, USA, 2019. SEG. doi: 10.1190/segam2019-3215222.1. [abstract co-author]
- (5) S. P. Gonzalez, F. F. Melo, V. C. F. Barbosa, and V. C. Oliveira Jr. Amplitude of the magnetic anomaly vector in low latitudes via equivalent layer. In *16th International Congress of the Brazilian Geophysical Society*, pages 1–6, Rio de Janeiro, Brazil, 2019. SBGF. doi: 10.22564/16cisbgf2019.028. [abstract co-author]

- (6) A. L. A. Reis, V. C. F. Barbosa, and V. C. Oliveira Jr. Equivalent layer technique for estimating magnetization direction. In *SEG Technical Program Expanded Abstracts 2019*, pages 1769–1773, San Antonio, USA, 2019. SEG. doi: 10.1190/segam2019-3216745.1. [abstract co-author]
- (7) L. S. Piaulino, V. C. F. Barbosa, and V. C. Oliveira Jr. Estimative of the gravity-gradient data from vertical component of gravitational attraction by using the equivalent-layer and fast fourier transform techniques. In *16th International Congress of the Brazilian Geophysical Society*, pages 1–6, Rio de Janeiro, Brazil, 2019. SBGF. doi: 10.22564/16cisbgf2019.235. [abstract co-author]
- (8) L. S. Piaulino, V. C. F. Barbosa, and V. C. Oliveira Jr. Estimative of gravity-gradient tensor components via fast iterative equivalent-layer technique. In *SEG Technical Program Expanded Abstracts 2019*, pages 1769–1773, San Antonio, USA, 2019. SEG. doi: 10.1190/segam2019-3215804.1. [abstract co-author]
- (9) L. B. Vital, V. C. Oliveira Jr., and V. C. F. Barbosa. Radial magnetic inversion to retrieve the geometry of 3d sources. In *SEG Technical Program Expanded Abstracts 2019*, pages 1754–1758. SEG, 2019. doi: 10.1190/segam2019-3215805.1. [abstract co-author]
- (10) L. B. Vital, C. Foss, V. C. Oliveira Jr., and V. C. F. Barbosa. Magnetic field inversion – the cost of freedom. In *2nd Australian Exploration Geoscience Conference: From Data to Discovery*, volume 2019, pages 1–5. ASEG, Taylor & Francis, 2019. doi: 10.1080/22020586.2019.12073182. [abstract co-author]
- (11) A. D. Arelaro, V. C. F. Barbosa, and V. C. Oliveira Jr. The sensitivity of ocean-bottom gravimeters at deep waters to mass changes in a synthetic hydrocarbon reservoir. In *16th International Congress of the Brazilian Geophysical Society*, pages 1–6, Rio de Janeiro, Brazil, 2019. SBGF. doi: 10.22564/16cisbgf2019.242. [abstract co-author]
- (12) F. C. L. Siqueira, V. C. F. Barbosa, and V. C. Oliveira Jr. Iterative fast equivalent-layer technique. In *79th EAGE Conference and Exhibition 2017*, pages 1–5, Paris, France, 2017. European Association of Geoscientists & Engineers. doi: 10.3997/2214-4609.201701077. [abstract co-author]
- (13) A. L. A. Reis and V. C. Oliveira Jr. Sed for optimal acquisition design and sensor-to-sample distance applied to scanning magnetic microscopy. In *Fifth bi-annual meeting of the LATINMAG*, Querétaro, México, 2017. LATINMAG. [abstract co-author]
- (14) D. Takahashi and V. C. Oliveira Jr. Modelagem magnética de fontes elipsoidais. In *VII Simpósio Brasileiro de Geofísica*, pages 1–5, Ouro Preto, Brazil, 2016. SBGF. doi: 10.22564/7simbgf2016.030. [attendee, abstract co-author]
- (15) A. L. A. Reis and V. C. Oliveira Jr. Impact of the sensor area, acquisition design and position noise on the estimation of the magnetization distribution within a rectangular rock sample. In *2016 AGU Fall Meeting*, San Francisco, USA, 2016. AGU. [attendee, abstract co-author]
- (16) K. A. T. Hallam and V. C. Oliveira Jr. Applications of differential operators in geodetic coordinates. In *2016 AGU Fall Meeting*, San Francisco, USA, 2016. AGU. [attendee, abstract co-author]

- (17) V. C. Oliveira Jr., D. P. Sales, V. C. F. Barbosa, and L. Uieda. Estimating the total magnetization direction of approximately spherical bodies. In *26th IUGG General Assembly - IAGA - A41 Lithospheric Field Modeling, the WDMAM and Tectonic Implications (Div. V) - A41p-280*, Prague, Czech Republic, 2015. IUGG. [attende, abstract co-author, poster presenter]
- (18) A. L. A. Reis, V. C. Oliveira Jr., E. Yokoyama, A. C. Bruno, and J. M. B. Pereira. Estimating the magnetization distribution within rectangular rock samples. In *26th IUGG General Assembly - IAGA - A06d-A06d A06/A07 Applied Rock Magnetism (Div. I) / Theoretical and Experimental Rock Magnetism (Div. I) - IUGG-1853*, Prague, Czech Republic, 2015. IUGG. [attende, abstract co-author, oral presenter]
- (19) V. C. Oliveira Jr. and V. C. F. Barbosa. 3-D radial gravity gradient inversion applied to the interpretation of the Vinton Salt Dome, USA. In *76th EAGE Conference and Exhibition 2014*, Amsterdam, Netherlands, 2014. EAGE. [attende, expanded abstract author, oral presenter]
- (20) L. Uieda, V. C. Oliveira Jr., and V. C. F. Barbosa. Modeling the Earth with Fatiando a Terra. In *12th Scientific Computing with Python Conference*, Austin, USA, 2013. SciPy. [expanded abstract co-author]
- (21) V. C. Oliveira Jr. and V. C. F. Barbosa. Polynomial equivalent layer. In *SEG Las Vegas 2012 Annual Meeting*, Las Vegas, USA, 2012. SEG. [expanded abstract author]
- (22) V. C. Oliveira Jr. and V. C. F. Barbosa. 3D radial inversion of gravity data for estimating the source’s geometry. In *73rd EAGE Conference and Exhibition incorporating SPE EUROPEC 2011*, Vienna, Austria, 2011. EAGE. [attende, expanded abstract author, oral presentation]
- (23) V. C. Oliveira Jr. and V. C. F. Barbosa. Radial gravity inversion constrained by total anomalous mass excess for retrieving 3D bodies. In *SEG San Antonio 2011 Annual Meeting*, San Antonio, USA, 2011. SEG. [expanded abstract author]

THESES SUPERVISED

- (1) [PhD] Title (portuguese): *Inversão magnética radial robusta para estimar a geometria de fontes 3D*, Title (english): *Robust radial magnetic inversion for estimating the geometry of 3D sources*, Student: Leonardo B. Vital, *Observatório Nacional, Brazil* (2020).
- (2) [PhD] Title (portuguese): *Desenvolvimentos teóricos da camada equivalente e suas aplicações a dados magnéticos*, Title (english): *Theoretical developments of equivalent layer and its applications to magnetic data*, Student: André L. A. Reis, *Observatório Nacional, Brazil* (2020).
- (3) [PhD] Title (portuguese): *Modelagem regional do campo de gravidade utilizando pontos de massa em coordenadas geodésicas*, Title (english): *Regional gravity modeling by using point masses in geodetic coordinates*, Student: Kristoffer A. T. Hallam, *Observatório Nacional, Brazil* (2019).

- (4) [MSc] Title (portuguese): *Inversão gravimétrica 2D com vínculo isostático*, Title (english): *2D gravity inversion with isostatic constraint*, Student: B. Marcela S. Bastos, *Observatório Nacional, Brazil* (2018).
- (5) [MSc] Title (portuguese): *Modelagem magnética 3D de corpos elipsoidais*, Title (english): *3D Magnetic modeling of ellipsoidal bodies*, Student: Diego Takahashi, *Observatório Nacional, Brazil* (2017).
- (6) [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).
- (7) [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): *Análise de sensibilidade de aquisição gravimétrica 4D de fundo oceânico*, Title (english): *Sensitivity analysis of 4D gravity survey at ocean bottom*, Student: André D. Arelaro, *Observatório Nacional, Brazil* (2020).
- (2) [PhD] Title (portuguese): *Métodos de inversão de dados magnéticos para estimar fontes regionais*, Title (english): *Magnetic data inversion methods for estimating regional sources*, Student: Marlon C. Hidalgo-Gato, *Observatório Nacional, Brazil* (2019).
- (3) [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).
- (4) [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).

CURRENT STUDENTS

- (1) Diego Takahashi, PhD, main supervisor, expected 2021.
- (2) Shayane P. Gonzalez, PhD, co- supervisor, expected 2021.
- (3) Larissa S. Piauilino, PhD, co- supervisor, expected 2022.
- (4) Edson F. Luza, MSc, main supervisor, expected 2022.
- (5) Raimundo Oscar S. Jr, MSc, main supervisor, expected 2022.
- (6) Asmminey A. S. Nascimento, MSc, co- supervisor, expected 2022.

TEACHING

Potential-field methods https://github.com/birocoles/Disciplina-metodos-potenciais <i>Graduate Program in Geophysics, Observatório Nacional, Brazil</i>	2014–present
Computational methods applied to Geophysics https://github.com/birocoles/Disciplina-metodos-computacionais <i>Graduate Program in Geophysics, Observatório Nacional, Brazil</i>	2014–present

PARTICIPATION IN DEPARTMENTAL COMMITTEES

Member of the Graduate Program in Geophysics Committee <i>Observatório Nacional, Brazil</i>	2020–present
Member of the Faculty Staff of the Graduate Program in Geophysics <i>Observatório Nacional, Brazil</i>	2014–present
Head of the Graduate Program in Geophysics Committee <i>Observatório Nacional, Brazil</i>	2017–2018
Member of the Graduate Program in Geophysics Committee <i>Observatório Nacional, Brazil</i>	2014–2018

FUNDING

- (1) [Conselho Nacional de Desenvolvimento Científico e Tecnológico \(CNPq\)](#), Title (portuguese): *Interpretação de dados magnéticos produzidos por distribuições de magnetização heterogêneas*, Title (english): *Interpretation of magnetic data produced by heterogeneous magnetization distributions*, ID: 315768/2020-7, Research grant: CNPq N° 09/2020 - Bolsas de Produtividade em Pesquisa - PQ, R\$ 79 200.00, Mar/2021 – Feb/2024.
- (2) [Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro \(FAPERJ\)](#), Title (portuguese): *Camada equivalente aplicada à caracterização magnética de feições estruturais em regiões de crosta oceânica próximas ao equador*, Title (english): *Equivalent layer applied to magnetic characterization of structural features on ocean crust at regions close to equator*, ID: E-26/202.729/2018, Research grant: Jovem Cientista do Nosso Estado – JCNE/2018, R\$ 75 600.00, Nov/2018 – Out/2021.
- (3) [Conselho Nacional de Desenvolvimento Científico e Tecnológico \(CNPq\)](#), Title (portuguese): *Camada equivalente aplicada ao processamento de dados magnéticos*, Title (english): *Equivalent layer applied to magnetic data processing*, ID: 308945/2017-4, Research grant: CNPq N° 12/2017 - Bolsas de Produtividade em Pesquisa - PQ, R\$ 39 600.00, Mar/2018 – Feb/2021.
- (4) [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, Research grant: MCTI/CNPQ/Universal 14/2014, R\$ 20 000.00, Nov/2014 – Nov/2017.

- (5) [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, Research grant: INST - Auxílio Instalação - 2013/2 , R\$ 10 000.00, Jun/2014 – Mar/2016.