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 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
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] J. Araujo, A. Reis, V. C. Oliveira Jr, A. Santos, C. Luz-Lima, E. Yokoyama, L. Mendoza, J. Pereira, A. Bruno. Characterizing Complex Mineral Structures in Thin Sections of Geological Samples with a Scanning Hall Effect Microscope. *Sensors* **2019**, *19*, 1636.

[2] D. Takahashi, V. C. Oliveira Jr. Ellipsoids (v1.0): 3-D magnetic modelling of ellipsoidal bodies. *Geoscientific Model Development* **2017**, *10*, 3591–3608.

[3] F. C. L. Siqueira, V. C. Oliveira Jr., V. C. F. Barbosa. Fast iterative equivalent-layer technique for gravity data processing: A method grounded on excess mass constraint. *GEOPHYSICS* **2017**, *82*, G57–G69.

[4] A. L. A. Reis, V. C. Oliveira Jr., E. Yokoyama, A. C. Bruno, J. M. B. Pereira. Estimating the magnetization distribution within rectangular rock samples. *Geochemistry, Geophysics, Geosystems* **2016**, *17*, 3350–3374.

[5] V. Oliveira Jr, D. Sales, V. Barbosa, L. Uieda. Estimation of the total magnetization direction of approximately spherical bodies. *Nonlinear Processes in Geophysics* **2015**, *22*, 215–232.

[6] L. Uieda, V. C. Oliveira Jr., V. C. F. Barbosa. Geophysical tutorial: Euler deconvolution of potential-field data. *The Leading Edge* **2014**, *33*, 448–450.

[7] F. F. Melo, V. C. F. Barbosa, L. Uieda, V. C. Oliveira Jr., J. B. C. Silva. Estimating the nature and the horizontal and vertical positions of 3D magnetic sources using Euler deconvolution. *GEOPHYSICS* **2013**, *78*, J87–J98.

[8] V. C. Oliveira Jr., V. C. Barbosa. 3-D radial gravity gradient inversion. *Geophysical Journal International* **2013**, *195*, 883–902.

[9] V. C. Oliveira Jr., V. C. F. Barbosa, L. Uieda. Polynomial equivalent layer. *GEOPHYSICS* **2013**, *78*, G1–G13.

[10] V. C. Oliveira Jr., V. C. F. Barbosa, J. B. C. Silva. Source geometry estimation using the mass excess criterion to constrain 3-D radial inversion of gravity data. *Geophysical Journal International* **2011**, *187*, 754–772.

LAST PARTICIPATIONS AT INTERNATIONAL CONFERENCES

[1] A. L. A. Reis, V. C. Oliveira Jr., *SED for optimal acquisition design and sensor-to-sample distance applied to scanning magnetic microscopy Fifth bi-anual meeting of the LATINMAG*, LATINMAG, Querétaro, México, 2017 [abstract co-author].

[2] A. L. A. Reis, 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 2016 AGU Fall Meeting*, AGU, San Francisco, USA, 2016 [attendee, abstract co-author].

[3] K. A. T. Hallam, V. C. Oliveira Jr., *Applications of differential operators in geodetic coordinates 2016 AGU Fall Meeting*, AGU, San Francisco, USA, 2016 [attendee, abstract co-author].

[4] V. C. Oliveira Jr., D. P. Sales, V. C. F. Barbosa, L. Uieda, *Estimating the total magnetization direction of approximately spherical bodies 26th IUGG General Assembly - IAGA - A41 Lithospheric Field Modeling, the WDMAM and Tectonic Implications (Div. V) - A41p-280*, IUGG, Prague, Czech Republic, 2015 [attendee, abstract co-author, poster presenter].

[5] A. L. A. Reis, V. C. Oliveira Jr., E. Yokoyama, A. C. Bruno, J. M. B. Pereira, *Estimating the magnetization distribution within rectangular rock samples 26th IUGG General Assembly - IAGA - A06d-A06d A06/A07 Applied Rock Magnetism (Div. I) / Theoretical and Experimental Rock Magnetism (Div. I) - IUGG-1853*, IUGG, Prague, Czech Republic, 2015 [attendee, abstract co-author, oral presenter].

[6] V. C. Oliveira Jr., V. C. F. Barbosa, *3-D Radial Gravity Gradient Inversion Applied to the Interpretation of the Vinton Salt Dome, USA 76th EAGE Conference and Exhibition 2014*, EAGE, Amsterdam, Netherlands, 2014 [attendee, expanded abstract author, oral presenter].

[7] L. Uieda, V. C. Oliveira Jr., V. C. F. Barbosa, *Modeling the Earth with Fatiando a Terra 12th Scientific Computing with Python Conference*, SciPy, Austin, USA, 2013 [expanded abstract co-author].

[8] V. C. Oliveira Jr., V. C. F. Barbosa, *Polynomial equivalent layer SEG Las Vegas 2012 Annual Meeting*, SEG, Las Vegas, USA, 2012 [expanded abstract author].

[9] V. C. Oliveira Jr., V. C. F. Barbosa, *3D Radial inversion of gravity data for estimating the source's geometry 73rd EAGE Conference and Exhibition incorporating SPE EUROPEC 2011*, EAGE, Vienna, Austria, 2011 [attendee, expanded abstract author, oral presentation].

[10] V. C. Oliveira Jr., V. C. F. Barbosa, *Radial gravity inversion constrained by total anomalous mass excess for retrieving 3D bodies SEG San Antonio 2011 Annual Meeting*, SEG, San Antonio, USA, 2011 [expanded abstract author].

THESES SUPERVISED

1. [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).
2. [MSc] Title (portuguese): "Inversão gravimétrica 2D com vínculo isostático", Title (english): "2D gravity inversion with isostatic constraint", Student: Barbara Marcela S. Bastos, *Observatório Nacional, Brazil* (2018).
3. [MSc] Title (portuguese): "Modelagem magnética 3D de corpos elipsoidais", Title (english): "3D Magnetic modeling of elipsoidal bodies", Student: Diego Takahashi, *Observatório Nacional, Brazil* (2017).
4. [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).
5. [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).

CURRENT STUDENTS

1. Andre L. A. Reis, PhD, main supervisor, expected 2020.
2. Leonardo B. Vital, PhD, main supervisor, expected 2020.
3. Andre D. Arelaro, MSc, co- supervisor, expected 2020.
4. Diego Takahashi, PhD, main supervisor, expected 2021.
5. Shayane P. Gonzalez, PhD, co- supervisor, expected 2021.
6. Larissa S. Piauilino, PhD, co- supervisor, expected 2022.

TEACHING

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

PARTICIPATION IN DEPARTMENTAL COMMITTEES

- Member of the Faculty Staff of the Graduate Program in Geophysics
  Observatório Nacional, 2014 – present
- Head of the Graduate Program in Geophysics Committee
  Observatório Nacional, 2017 – 2018
- Member the Graduate Program in Geophysics Committee
  Observatório Nacional, 2014 – 2018

FUNDING

- 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.
- 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.
- 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.
- 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.