

# PEDRO DA SILVA PEIXOTO

Assistant Professor Applied Mathematics  
Institute of Mathematics and Statistics  
University of Sao Paulo, Brazil  
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(August 2019)

## MAIN AREAS OF INTEREST AND EXPERTISE

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- Applied Mathematics, Numerical Analysis
- Computational Geophysical Fluid Dynamics
- Dynamic Meteorology and Oceanography
- Seismic Imaging, Full Wave Inversion
- Applied Statistics and Biomathematics

## FORMAL EDUCATION

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**Postdoc/Sabbatical** 2015–2016  
*University of Exeter* Exeter, UK

- Honorary Research Fellow
- Hosted by Prof. John Thuburn
- Grantee of São Paulo Research Foundation - FAPESP

**PhD** 2009–2013  
*Institute of Mathematics and Statistics-University of Sao Paulo* Sao Paulo, Brazil

- Applied Mathematics, Numerical Analysis
- Title: Analysis of discretizations and interpolations on icosahedral grids and applications to semi-Lagrangian transport models
- Supervisor: Prof. Saulo Rabêllo Maciel de Barros
- Grantee of : National Council for Scientific and Technological Development (CNPq)
- Honourable mention in the award of best PhD theses at the University of Sao Paulo in the years of 2012/2013 for Exact and Earth Sciences (Menção - Prêmio Tese Destaque USP).
- Visiting fellow / sandwich program at the Isaac Newton Institute of Mathematical Sciences, University of Cambridge, UK (2012).

**MSc** 2007–2009  
*Institute of Mathematics and Statistics- University of Sao Paulo* Sao Paulo, Brazil

- Applied Mathematics, Numerical Analysis
- Title: Numerical solution of PDE using harmonic wavelets
- Supervisor: Prof. Saulo Rabêllo Maciel de Barros
- Grantee of: National Council for Scientific and Technological Development (CNPq)

**Graduate Specialization** 2006–2007  
*Oceanographic Institute- University of Sao Paulo* Sao Paulo, Brazil

- Area: Measure, Analysis, Prediction and Modeling of the Sea Level, Institute of Oceanography
- Title: Jason-1: Satellite altimetry data reading of sea level
- Supervisor: Dr. Carlos Augusto de Sampaio França

**Bach (Hons)***Institute of Mathematics and Statistics- University of Sao Paulo*

2002–2006

*Sao Paulo, Brazil*

- Bach. Degree in Computational and Applied Mathematics
- Title: Econometric modeling in industrial companies
- Supervisor: Prof. Dr. Clélia Maria de Castro Toloi
- Honourable mention for Bach. Degree

**PROFESSIONAL EXPERIENCE**

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**Assistant Professor (MS3.1)***Institute of Mathematics and Statistics- University of Sao Paulo*

2014 --

*Sao Paulo, Brazil*

- Applied Mathematics
- Department of Applied Mathematics
- Head of Scientific Computing Laboratory
- Vice-head of the Masters and PhD Programs
- Teaching: Numerical analysis, focused on PDEs and ODEs

**Visiting Professor***Center for Weather Forecast and Climatic Studies -INPE*

2019

*Cachoeira Paulista, Brazil*

- Winter school on numerical methods for weather forecasting

**Honorary Research Fellow***University of Exeter*

2015–2016

*Exeter, UK*

- Applied Mathematics and Geophysical Fluid Dynamics
- Fellowship from FAPESP BPE

**Visiting Fellow***University of Cambridge*

2012–2012

*Cambridge, UK*

- Isaac Newton Institute of Mathematical Sciences
- Multiscale Numerics for the Atmosphere and Ocean Programme
- Grantee of University of Cambridge and CNPq

**Visiting Professor***Universidade Federal de São Paulo – UNIFESP*

2008–2012

*São Paulo, Brazil*

- Teaching of Biostatistics and technical consulting in medical data.

**Visiting Professor***Instituto Butantan – IBU*

2006–2013

*São Paulo, Brazil*

- Teaching of Biostatistics and technical consulting in medical data.

**Industry internship***Johnson & Johnson S/A Industria e Comercio*

2004–2005

*Sao Paulo, Brazil*

- Development of an econometric sales forecasting model

**Published Papers**

- [1] Pedro S Peixoto and Martin Schreiber. Semi-lagrangian exponential integration with application to the rotating shallow water equations. *SIAM Journal on Scientific Computing*, 2019. (to appear).
- [2] Martin Schreiber, Pedro S Peixoto, Terry Haut, and Beth Wingate. Beyond spatial scalability limitations with a massively parallel method for linear oscillatory problems. *The International Journal of High Performance Computing Applications*, 32(6):913–933, 2018. Citations: 15 google scholar, 3 scopus.
- [3] A. Schmitt, M. Schreiber, P. Peixoto, and M. Schäfer. A numerical study of a semi-lagrangian parareal method applied to the viscous burgers equation. *Computing and Visualization in Science*, 19(1):45–57, Jun 2018. Citations: 2 google scholar, 0 scopus.
- [4] Pedro S Peixoto, John Thuburn, and Michael J Bell. Numerical instabilities of spherical shallow-water models considering small equivalent depths. *Quarterly Journal of the Royal Meteorological Society*, 144(710):156–171, 2018. Citations: 8 google scholar, 8 scopus.
- [5] Michael J. Bell, Pedro S. Peixoto, and John Thuburn. Numerical instabilities of vector-invariant momentum equations on rectangular C-grids. *Quarterly Journal of the Royal Meteorological Society*, 143(702):563–581, 2017. Citations: 14 google scholar, 12 scopus.
- [6] Pedro S. Peixoto. Accuracy analysis of mimetic finite volume operators on geodesic grids and a consistent alternative. *Journal of Computational Physics*, 310:127 – 160, 2016. Citations: 14 google scholar, 10 scopus.
- [7] Pedro S. Peixoto and Saulo R.M. Barros. On vector field reconstructions for semi-lagrangian transport methods on geodesic staggered grids. *J. Comput. Phys.*, 273(0):185 – 211, 2014. Citations: 16 google scholar, 9 scopus.
- [8] Mila Torii Corrêa Leite, Luiz G. Freitas-Filho, Andréia Silva Oliveira, Patrícia Semedo-Kuriki, Marcus Laks, Victor Eduardo Arrua Arias, and Pedro S. Peixoto. The use of mesenchymal stem cells in bladder augmentation. *Pediatric Surgery International*, 30(4):361–370, 2014. Citations: 15 google scholar, 13 scopus.
- [9] Leijiane F. Sousa, Carolina A. Nicolau, Pedro S. Peixoto, Juliana L. Bernardoni, Sâmella S. Oliveira, José Antonio Portes-Junior, Rosa Helena V. Mourão, Isa Lima-dos Santos, Ida S. Sano-Martins, Hipócrates M. Chalkidis, Richard H. Valente, and Ana M. Moura-da Silva. Comparison of phylogeny, venom composition and neutralization by antivenom in diverse species of bothrops complex. *PLoS Negl Trop Dis*, 7(9):1–16, 09 2013. Citations: 82 google scholar, 60 scopus.
- [10] Pedro S. Peixoto and Saulo R. M. Barros. Analysis of grid imprinting on geodesic spherical icosahedral grids. *J. Comput. Phys.*, 237:61 – 78, 2013. Citations: 25 google scholar, 17 scopus.
- [11] Saulo R.M. Barros and Pedro S. Peixoto. Computational aspects of harmonic wavelet galerkin methods and an application to a precipitation front propagation model. *Computers & Mathematics with Applications*, 61(4):1217 – 1227, 2011. Citations: 3 google scholar, 2 scopus.
- [12] C.T. Perciani, P.S. Peixoto, W.O. Dias, F.S. Kubrusly, and M.M. Tanizaki. Improved method to calculate the antibody avidity index. *Journal of Clinical Laboratory Analysis*, 21(3):201–206, 2007. Citations: 38 google scholar, 27 scopus.

## Selected Talks (\* published abstracts)

- [1] Pedro S. Peixoto. Semi-lagrangian exponential integration with application to the rotating shallow water equations. *PDEs on the sphere - Montreal - CA*, 2019.
- [2] \*Pedro S. Peixoto and Martin Schreiber. Semi-lagrangian exponential integration with application to the rotating shallow water equations. *International Congress of Mathematicians (ICM) - Rio de Janeiro - Brazil*, 2018.
- [3] Pedro S. Peixoto. Semi-lagrangian exponential integration and a possible route towards time-parallelism in weather and climate modelling. *Gung Ho Network Meeting Reading University and European Centre for Medium-Range Weather Forecasts (ECMWF) - Reading - UK*, 2018.
- [4] \*Pedro S. Peixoto, John Thuburn, and Michael Bell. Numerical instabilities of vector invariant momentum equations on c-grids. *PDEs on the Sphere - Paris*, 2017.
- [5] M. Schreiber, \*P. S. Peixoto, T. Haut, and B. Wingate. Beyond spatial scalability limitations with a massively parallel method for linear oscillatory problems. *International Conference on Spectral and High Order Methods (ICOSAHOM)*, 2016.
- [6] \*Pedro S. Peixoto. Accuracy analysis of mimetic finite volume operators on geodesic grids and a consistent alternative. *Mathematics of the Weather - Erquy FR*, 2015.
- [7] \*Pedro S. Peixoto. Accuracy analysis of mimetic finite volume operators on geodesic grids. *Cli-MathNet Conference Bath UK*, 2015.
- [8] \*Pedro S. Peixoto. Geometric cell alignment on geodesic grids. *PDEs on the Sphere Workshop - National Center for Atmospheric Research (NCAR)*, 2014.
- [9] \*Pedro S. Peixoto. Analysis of grid imprinting on geodesic spherical icosahedral grids. *Multiscale Numerics for the Atmosphere and Ocean Programme at the Isaac Newton Institute of Mathematical Sciences - University of Cambridge UK*, 2012.
- [10] \*Saulo R. M. Barros and Pedro S. Peixoto. On the use of harmonic wavelets for the solution of some pde's and an application to a precipitation front propagation model. *Wavelets & Applications in Numerical Methods for PDEs and Signal Processing - Serra Negra, SP, Brazil*, 2010.
- [11] Pedro S. Peixoto and Saulo R. M. Barros. Numerical solution of pdes using harmonic wavelets. *Seminar at National Institute For Space Research (INPE) - Brazil*, 2009.

## MAJOR GRANTS

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>CNPq productivity grant</b><br><i>CNPq</i>                                                                                                                                        | 2018–2020 |
| · Numerical methods for the next generation weather and climate models                                                                                                               |           |
| <b>Seismic Imaging Project</b><br><i>Shell/ANP</i>                                                                                                                                   | 2018–2022 |
| · Software technologies for modelling and inversion: Optimization of finite-difference seismic wave solvers and their adjoints                                                       |           |
| · This project is part of major Shell funded project for software technologies for modelling and inversion, consisting of 11 principal investigators and a total of 64 participants. |           |
| <b>Young Scientific Grant</b><br><i>FAPESP</i>                                                                                                                                       | 2017–2021 |
| · Numerical methods for the next generation weather and climate models                                                                                                               |           |
| · Grant for travel and equipment resources (3 years)                                                                                                                                 |           |
| <b>Universal Project</b><br><i>CNPq</i>                                                                                                                                              | 2015–2017 |
| · Numerical modelling of geophysical fluids on geodesic grids                                                                                                                        |           |
| · Grant for travel and equipment resources (3 years)                                                                                                                                 |           |
| <b>Santander Mobility Grant</b><br><i>Santander</i>                                                                                                                                  | 2017–2017 |
| · Partnership visit to University of Exeter - UK.                                                                                                                                    |           |

**Postdoc**

- Felipe Augusto Guedes da Silva (co-supervisão). Finite differences optimized for low dispersion applied to seismic imaging. Applied Mathematics. IME-USP. Fellowship from Shell/ANP. (2019 --)

**PhD**

- Fabricio R. Lapolli. Finite volume methods for ocean dynamics on distorted grids. Applied Mathematics. IME-USP. Fellowship from CNPq. (2019 --)
- Wenderson Alexandre de Sousa Silva. Finite volume methods for cubed sphere grids. Applied Mathematics. IME-USP. Fellowship from CAPES. (2017 --)
- Fernando V. Ravelo. Exploring the potential of exponential integrations methods for the seismic imaging (Full Waveform Inversion) problem. Applied Mathematics. IME-USP. Fellowship from Shell/ANP (2017 --)
- Luana Tais Bassani. Modelling Aedes aegypti abundance considering the daily weather and its impact over the dormancy state. Applied Mathematics. IME-USP. Fellowship from CAPES/CNPq (2016 --)
- Leonardo A. Poveda Cuevas (co-supervision). Supra-convergence of a finite volume discretization of the laplacian on quasi-uniform spherical grids. Applied Mathematics. IME-USP. Fellowship from CAPES (2015 --).
- Jeferson Brambatti. Um método de volumes finitos robusto de alta ordem para advecção em malhas esféricas geodésicas. Applied Mathematics. IME-USP. Fellowship from CAPES (2012 - 2019)

**MSc**

- Juan Camilo Barrios Camargo. Finite volume methods for wave modeling of seismic imaging. Applied Mathematics. IME-USP. Fellowship from Shell/ANP (2019 --).
- Luan F. Santos. Finite volume methods for shallow water equations considering topography based local refinement in spherical Voronoi grids. Applied Mathematics. IME-USP. Fellowship from FAPESP (2018 --).
- Ana Cecília Rojas Mendoza. Numerical Laplace transform methods for hyperbolic equations. Applied Mathematics. IME-USP. Fellowship from CAPES (2016 --)

**Scientific initiation**

- Arthur Clemente Giannotta. Automatic code generation for implicit finite difference methods for seismic imaging. Engenharia Mecânica - POLI - USP. Fellowship from Shell/ANP (2019 --)
- Luan da Fonseca Santos. Topography based local refinement in spherical Voronoi grids. Applied Mathematics. IME-USP. Fellowship from FAPESP (2017-2018).

**Trabalho de Formatura**

- Wagner Jorcovich Nunes da Silva. Uma introdução à computação quântica. 2018. (Bacharelado em Matemática Aplicada e Computacional) - IME-USP.
- Jenifer Waschburger Monich. Modelagem da dinâmica epidemiológica da dengue. 2018. (Bacharelado em Matemática Aplicada e Computacional) - IME - USP.
- Vinicus Callegari. Métodos paralelos no tempo para as equações de Lorenz. 2016. Trabalho de Conclusão de Curso. (Bacharelado em Matemática Aplicada e Computacional) - IME - USP.
- Guilherme Lins Arcoverde. O modelo de ciclos econômicos de Goodwin: Considerações sobre estabilidade e convergência. 2015. Trabalho de Conclusão de Curso. (Bacharelado em Matemática Aplicada e Computacional) - IME-USP.
- Cassiano Reinert Novais dos Santos. Resolução numérica da equação de Black-Scholes em uma e duas dimensões com OpenMP. 2014. Trabalho de Conclusão de Curso. (Bacharelado em Matemática Aplicada e Computacional) - IME-USP.

- Fernando Ozaki. Apreçamento de Opções Europeias e o uso no mercado financeiro. 2011. Trabalho de Conclusão de Curso. (Bacharelado em Matemática Aplicada e Computacional) - IME-USP.

## TEACHING

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### Post Grad

- Numerical methods for atmospheric modelling: Finite Volumes. CPTEC-INPE. 2019
- Numerical Analysis. IME-USP. 2017
- Numerical methods for PDES. IME-USP. 2015.
- Biostatistics - Instituto Butantan (Toxicology). 2011-2013.
- Biostatistics - UNIFESP (Surgery and Experimentation). 2011-2012.

### Undergrad

- Numerical methods and applications. Eng. School - USP. 2016-2019.
- Numerical Analysis. IME-USP. 2018.
- Numerical methods for ODEs. IME-USP. 2014.
- Numerical methods for PDEs. IME-USP. 2014.

### Honoured professor

- Class of 2016 - Bach. Applied and Computational Mathematics, IME-USP
- Class of 2016 - Bach. Applied Mathematics, IME-USP

## INDICATORS

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- (a) Books - 0
- (b) Peer reviewed papers - 12
- (c) Book chapters - 0
- (d) Mentoring of MSc dissertations, ongoing/concluded - 3/0
- (e) Mentoring of PhD thesis, ongoing/concluded - 5/1
- (f) Citations :
  - \* Google scholar (<https://scholar.google.com/citations?user=uV5W52AAAAAJ>)
    - Citations: 242, h-index: 8
  - \* Scopus (<https://scopus.com/authid/detail.uri?authorId=16319901600>)
    - Citations: 161, h-index: 8
  - \* Web of Science ResearcherID <https://publons.com/researcher/I-7243-2013/>
    - Citations: 160, Average citations per paper: 14.6, h-index: 8
  - \* ORCID <https://orcid.org/0000-0003-2358-3221>

## SELECTED ADDITIONAL INFORMATION

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### **Associate Editor**

*Monthly Weather Review*

2015 --

*American Meteorological Society*

- Premier Journal in Meteorology

### **Ad hoc Reviewer**

- Applied Mathematics and Computation (2011)
- Applications and Applied Mathematics: An International Journal (AAM) (2013)
- Geoscientific Model Development (2014 --)
- International Journal of Computer Mathematics (2014 --)
- Quarterly Journal of the Royal Meteorological Society (2014 --)
- Monthly Weather Review (2015 --)
- Journal of Computational Physics (Print) (2017 --)
- Ocean Dynamics (Print) (2017)
- Computers & Fluids (2017)
- International Congress of Mathematicians ICM (2018)
- Meteorology and Atmospheric Physics (2018)
- Sao Paulo Research Foundation (FAPESP) (2017 --)

### **Brazilian Congress of Young Researchers on Mathematics**

2014-2018

- Main organizer of 1st Edition (São Paulo 2014)
- Numerical analysis session organizer of 2nd Edition (Campinas 2016)
- Main organizer and FAPESP funding coordinator of 3rd Edition (Curitiba 2018)