Luan da Fonseca Santos

luanfs.github.io | ls9640@princeton.edu | luanfsantos14@gmail.com

Summary

I am an applied mathematician and currently a Postdoctoral Researcher Associate at Princeton University working with the FV3 team at the Geophysical Fluid Dynamics Laboratory (GFDL). I hold a PhD degree in Applied Mathematics from the University of São Paulo. My primary research area focuses on advancing numerical techniques for global atmospheric models, specifically the dynamical core development.

Experience

Postdoctoral Researcher Associate Princeton, NJ, USA

Atmospheric and Oceanic Sciences Program, Princeton University *July 2024 - Present*

- Implementing and evaluating specific enhancements to FV3's numerical algorithms to advance the accuracy and efficiency of FV3-based weather and climate models. Supervisors: Dr. Lucas Harris and Dr. Joseph Mouallem.
- Working at the U.S. National Oceanic and Atmospheric Adminstration's Geophysical Fluid Dynamics Laboratory (NOAA-GFDL) with the FV3 team.

Graduate Researcher Student São Paulo, SP, Brazil

Institute of Mathematics and Statistics, University of São Paulo *March 2018 - May 2024*

- Developed topography-based locally refined grids for South America for the NCAR MPAS model. Implemented a moist shallow-water model to assess these grids, resulting in a paper published in an international peer-reviewed journal.
- Developed and implemented an enhanced transport scheme for the NOAA-GFDL FV3 model with minimal additional computational overhead, resulting in a paper submitted for revision.
- Participated in a two-week research visit to the Atmospheric and Oceanic Sciences Program at Princeton University and the Geophysical Fluid Dynamics Laboratory (hosts: Dr. Joseph Mouallem and Dr. Lucas Harris), where I gave a talk to the FV3 team.

Teaching Assistant São Paulo, SP, Brazil

University of São Paulo *2017 – 2021*

- Grad courses:
  - 1st sem/2019, 1st sem/2020 and 1st sem/2021 - MAP5729 - Introduction to Numerical Analysis (Institute of Mathematics and Statistics).
- Undergrad courses:
  - 2nd sem/2019 - MAP2320 - Numerical methods for PDEs (Institute of Mathematics and Statistics).
  - 2nd sem/2018 - MAP0214 - Numerical Calculus with Applications to Physics (Institute of Astronomy, Geophysics and Atmospheric Sciences).
  - 1st sem/2017 - MAC0427 - Non-linear Optimization (Institute of Mathematics and Statistics).

Undergraduate Researcher Student São Paulo, SP, Brazil

Institute of Mathematics and Statistics, University of São Paulo *July 2017- December 2017*

- Worked on the implementation of algorithms for generating topography-based, locally refined Voronoi grids on the sphere. Funded by the São Paulo Research Foundation (FAPESP), grant number 17/11542-0.

Part-time Computer Lab Monitor São Paulo, SP, Brazil

Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo *January 2015 - July 2016*

- Ensured smooth operation of computer lab hardware and software, providing technical support to students and resolving any issues promptly.

Education

Institute of Mathematics and Statistics, University of São Paulo São Paulo, SP, Brazil
Ph.D. in Applied Mathematics *March 2020 - May 2024*

- Thesis title: Analysis of finite-volume advection schemes on cubed-sphere grids and an accurate alternative for divergent winds. Supervisor: Dr. Pedro Peixoto.
- With financial support from São Paulo Research Foundation (FAPESP), grant 20/10280-4 and CAPES.

Institute of Mathematics and Statistics, University of São Paulo São Paulo, SP, Brazil
M. Sc. in Applied Mathematics *March 2018 - March 2020*

- Dissertation title: Analysis of mimetic finite volume schemes on classical and moist shallow water models considering topography based local refinement in spherical Voronoi grids. Supervisor: Dr. Pedro Peixoto.
- With financial support from São Paulo Research Foundation (FAPESP), grant 17/25191-4.

Institute of Mathematics and Statistics, University of São Paulo São Paulo, SP, Brazil
B. Sc. in Applied Mathematics (GPA: 9.3/10) *2014 - 2017*

- Undergraduate thesis: Local refinement and interpolation in spherical icosahedral grids. Supervisor: Dr. Pedro Peixoto.
- Honorable mention for outstanding performance in the Applied Mathematics B.Sc. program.

Publication list

- Luan F. Santos and Pedro S. Peixoto (2024). Analysis of finite-volume transport schemes on cubed-sphere grids and an accurate scheme for divergent winds, **In review**, Preprint: http://dx.doi.org/10.2139/ssrn.4866660.
- Luan F. Santos and Pedro S. Peixoto (2021). Topography based local spherical Voronoi grid refinement on classical and moist shallow-water finite volume models, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-14-6919-2021.

Presentations and participation at events

- **2023**: Talk at the *FV3 group meeting*, GFDL/NOAA, Princeton, USA: *Enhancing accuracy of FV3 finite-volume operators.*
- **2021**: Participation in the ESCAPE2/Fondazione Alessandro Volta Summer school program - *Towards exascale computing for numerical weather prediction, Lake Como School of Advanced Studies (online).*
- **2021**: Talk at *PDEs on the sphere 2021*, Offenbach, Germany (online): *Topography based local spherical Voronoi grid refinement on classical and moist shallow-water finite volume models.*
- **2019**: Participation in the *Winter School in Atmospheric Numerical Modeling at CPTEC (Center for Weather Forecasting and Climate Studies), Cachoeira Paulista, SP, Brazil.*
- **2019**: Poster Presentation at *PDEs on the sphere 2019*, Montréal, Québec, Canada: *Topography based local refinement in spherical Voronoi grids.*

Referee Activities

- Meteorological Applications (2024).

Technical Skills

- Programming languages: Fortran, Python (NumPy, SciPy, Matplotlib, Cartopy), C, and Matlab.
- Experience with parallel programming using OpenMP and MPI.
- General software and tools: Linux environment, Bash scripts, Git, remote servers, SSH, Tmux, Vim, LaTeX.

Links

- Personal webpage: https://luanfs.github.io/
- Google scholar: https://scholar.google.com/citations?user=D-uXvM0AAAAJ&hl=en
- ORCID: https://orcid.org/0000-0001-9084-6170

Additional Information

- Date of birth: August 7, 1993.
- Citizenship: Brazilian.
- Gender: Male.
- Marital status: Married.
- Languages: Portuguese (native) and English (advanced).