

Luan da Fonseca Santos

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SUMMARY

I am an applied mathematics researcher. Currently, I am a Postdoctoral Researcher at Princeton University working at the Geophysical Fluid Dynamics Laboratory. 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

Atmospheric and Oceanic Sciences Program, Princeton University

Princeton, NJ, USA

Postdoctoral Researcher

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 Administration's Geophysical Fluid Dynamics Laboratory (NOAA-GFDL) with the FV3 team.

Institute of Mathematics and Statistics, University of São Paulo

São Paulo, SP, Brazil

Graduate Researcher Student

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

2017 – 2021

University of São Paulo

São Paulo, SP, Brazil

- 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 in differential equations II (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 Programming (Institute of Mathematics and Statistics).

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.

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.

- Project title: 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>.

REFeree ACTIVITIES

- Meteorological Applications (2024).

PRESENTATIONS

- **2023**: Talk at the *FV3 group meeting*, GFDL/NOAA, Princeton, USA: *Enhancing accuracy of FV3 finite-volume operators*.
- **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**: Poster Presentation at *PDEs on the sphere 2019*, Montréal, Québec, Canada: *Topography based local refinement in spherical Voronoi grids*.

PARTICIPATION AT EVENTS

- **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)*.
- **2019**: Participation in the *Winter School in Atmospheric Numerical Modeling at CPTEC (Center for Weather Forecasting and Climate Studies)*, Cachoeira Paulista, SP, Brazil.

GRANTS

- Doctoral degree scholarship - São Paulo Research Foundation (FAPESP), grant 20/10280-4, 2020-2024.
- Master's degree scholarship - São Paulo Research Foundation (FAPESP), grant 17/25191-4, 2018-2020.
- Undergraduate research funding - São Paulo Research Foundation (FAPESP), grant 17/11542-0, 2017.

LINKS

- Personal webpage: <https://luanfs.github.io/>
- Google scholar: <https://scholar.google.com/citations?user=D-uXvM0AAAAAJ&hl=en>
- ORCID: <https://orcid.org/0000-0001-9084-6170>

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, L^AT_EX.

ADDITIONAL INFORMATION

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