Luan da Fonseca Santos

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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). My primary research focuses on the development, analysis, and implementation of numerical methods for global atmospheric modeling.

Education

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.

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.

B. Sc. in Applied Mathematics (GPA: 9.3/10) *February 2014 - December 2017*

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

Research visits

- September 2023 - Princeton University - Atmospheric & Oceanic Sciences Program.

Experience

Cooperative Institute for Modeling the Earth System, Princeton University Princeton, NJ, USA

Postdoctoral Researcher Associate *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.

Institute of Mathematics and Statistics, University of São Paulo São Paulo, SP, Brazil

Graduate Researcher Student *March 2018 - May 2024*

- Numerical methods for PDEs, finite-volume/difference schemes for geophysical fluid dynamics on a sphere, locally refined Voronoi grids, cubed-sphere grids. With financial support from São Paulo Research Foundation (FAPESP), grant numbers 17/25191-4, 20/10280-4. Supervisor: Dr. Pedro Peixoto.

Undergraduate Researcher Student *July 2017- December 2017*

- Worked on the implementation of algorithms for generating topography-based, locally refined spherical Voronoi grids on the sphere. Funded by FAPESP, grant number 17/11542-0. Supervisor: Dr. Pedro Peixoto.

Teaching Assistant

- Grad courses: 1^{st} sem/2019, 1^{st} sem/2020 and 1^{st} sem/2021 - MAP5729 - Introduction to Numerical Analysis.
- Undergrad courses:
  - 2^{nd} sem/2019 - MAP2320 - Numerical methods for PDEs.
  - 2^{nd} sem/2018 - MAP0214 - Numerical Calculus with Applications to Physics.
  - 1^{st} sem/2017 - MAC0427 - Non-linear Optimization.

Publication list

- Luan F. Santos, Joseph Mouallem, Pedro S. Peixoto (2024). Analysis of finite-volume transport schemes on cubed-sphere grids and an accurate scheme for divergent winds, Journal of Computational Physics, https://doi.org/10.1016/j.jcp.2024.113618.
- 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, C, and Matlab.
- Experience with parallel programming using OpenMP and MPI.
- General software and tools: Linux environment, Bash scripts, Git, remote servers, Vim, LaTeX.

Links

- Personal webpage: https://luanfs.github.io/
- Google scholar: https://scholar.google.com/citations?user=D-uXvM0AAAAJ&hl=en

Additional Information

- Citizenship: Brazilian.
- Languages: Portuguese (native) and English (advanced).