Daniel Andrade Schuch

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Abstract

Atmospheric scientist specialized in weather and air quality modeling, satellite data analysis, and computational tool development. Currently a Postdoctoral Research Associate at Northeastern University, working with air quality model application, evaluation, and development. Experienced in integrating model simulations with observations, including satellite remote sensing, for atmospheric composition and climate research. Actively contributing to open-source software projects, leading scientific projects, and recognized with an award for research excellence. My research interests include the atmospheric dynamics, boundary layer, turbulence, transport phenomena, aerosols, and atmospheric chemistry. Dedicated to o advance the understanding of atmospheric processes through pioneering research and interdisciplinary research to address real-world environmental challenges.

Online: schuch.github.io/resume - github.com - scholar.google.com - orcid.org - researchgate.net

Experience

Postdoctoral Research Associate 2000 - present

Northeastern University, Boston-MA, U.S.

Mentoring of PhD candidates. Application, evaluation and development of Air Quality models for multiple projects and regions at CASCADE (Clean Air Smart City and Digital Earth) lab, across regions including Brazil, US, Africa, and Dubai.

- Brazil: Multi-year WRF-Chem projections of air quality
- US: Built GHG emission frameworks for WRF-GHG, and application and evaluation of UFS-CMAQ
- Africa: Application and optimization of WRF-Chem to simulate $PM_{2.5}$
- Dubai: Applied CAMx with advanced tools for source apportionment and emissions scenario simulation

Instructor for WRF-Chem model 2024 - 2024

World Meteorological Organization (WMO)

WRF-Chem model training school on air quality prediction and forecasting for “Training Course on Seamless Prediction of Air Pollution in Africa”

- Designed model domains, prepared inputs, and performed sensitivity analysis for WRF-Chem during a training course on air quality forecasting in Africa
- Delivered online instruction and led hands-on simulation sessions for international trainees

Postdoctoral Research 2018 - 2019

University of São Paulo, São Paulo-SP, Brazil

Study of the impact on air quality of emission scenarios in the formation of the secondary pollutants: ozone and particulate matter in Brazilian metropolitan regions using numerical models.

- Investigated secondary pollutant (O_3 and $PM_{2.5}$) formation under varied emission and climate scenarios using WRF-Chem
- Generated insights into future air quality trends across Brazilian metropolitan regions

Postdoctoral Research 2017 - 2018

University of São Paulo, São Paulo-SP, Brazil

Research focused on obtaining a complete diagnosis of the impact of vehicle fuels on air quality in urban regions in the southeast of Brazil and adjacent areas, through atmospheric modelling and scenario studies.

- Analyzed the impact of vehicle fuels on air quality in São Paulo through scenario modeling and WRF-Chem simulations using street-level emissions
- Environmental Responsibility Award, XIV Brazilian Association of Automotive Engineering, 2021

Specialist external consultant 2016 - 2016

ENEVA LTD., Rio de Janeiro-RJ, Brazil

Perform simulations of the dispersion of sulfur dioxide (SO_2) from the thermoelectric power generation plant at Porto do Itaqui located in São Luís (Maranhão) using WRF-CHem and analysis of the results. The analysis was delivered in the form of media (images and animation) and a technical report together with the technical opinion.

- Simulated dispersion of SO_2 from a thermoelectric plant using WRF-Chem; produced technical reports, visualizations, and animations for stakeholders

Researcher DTI-2 2011 - 2013

INPE, São José dos Campos-SP, Brazil

The research focused on determining turbulent flow behavior in clearing regions and the mechanisms of atmospheric interaction between clearings and the Amazon forest, such as recirculation, boundary layer structure and formation of organized structures for this type of flow regime.

- Modeled turbulent flow and boundary layer dynamics for clearings in the Amazon forest using LES and wind tunnel studies

Education

DSC in Sciences and Spatial Technology 2013 - 2017

Thesis: *Atmospheric model for forecasting and transporting effluent gases from rocket launches applied to the Alcântara Launch Center.*

Technological Institute of Aeronautics (ITA), São Paulo, Brazil

MSc in Meteorology, Micrometeorology 2009 - 2011

Thesis: *Simulation of pollutant dispersion in the atmosphere using the integral transform technique for an arbitrary source.*

University of Pelotas (UFPEL), Pelotas, Brazil

BSc in Meteorology 2005 - 2009

University of Pelotas (UFPEL), Pelotas, Brazil

Skills

Modeling Skills

- **Air Quality Models** (Expert): WRF-Chem (emissions, boundary conditions, physics schemes, model modification), CAMx, UFS-CMAQ
- **Weather Forecast Models** (Advanced): WRF (NWP, nested domains, physics schemes), WRFDA (data assimilation), UFS Model
- **Emission Models** (Intermediate): VEIN, EmissV, SMOKE
- **Oceanic Models** (Intermediate): WRF-Chem-ROMS

Data Analysis & Processing

- **Emission Processing** (Advanced): WRF-Chem, CAMx, UFS-CMAQ
- **Observation Comparison** (Advanced): Model-observation comparison and statistical analysis
- **R and Python** (Advanced): Data processing, scripting, visualization, and analysis
- **Satellite and Specialized datasets** (Advanced): Processing, visualization and use of grided datasets (CERES, MODIS, MAIAC, SCIAMCHY, MOPITT, OMI, AIRS, MERGE, GPCP, PRISM, TMPA, TEMPO) and non-grided datasets (METAR, INMET, AQS, AERONET, Purple Air) to improve and validate models

Programmer & Git

- **R** (Expert): R package development, scripting and analysis
- **Python** (Intermediate): scripting and analysis
- **Fortran / C# / C++** (Intermediate): compiling and debugging
- **Bash / Csh** (Intermediate): Automation, model job submission
- **Git** (Intermediate): version control and collaborative development

Supercomputing

- **HPC** (Advanced): Globus, Derecho, Anvil, Discovery, Cheyenne, Stampede2
- **Job Schedulers & Workflow** (Intermediate): Slurm, PBS, Rococo

Languages

- **Portuguese** (Native)
- **English** (Professional)
- **Japanese /** 日本語 (Beginner)
- **Spanish** (Beginner)