

Dennies Bor

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PROFESSIONAL SUMMARY

Scientific computing researcher developing physics-based simulations and end-to-end modeling pipelines for infrastructure and space-environment risk. Strong background in numerical methods, nonlinear optimization, uncertainty quantification, and scalable workflows for large scenario studies.

TECHNICAL SKILLS

- **Numerical Methods:** ODE/PDE methods (Euler, RK4), iterative solvers (SOR), finite differences, particle/field simulation fundamentals.
- **Optimization & UQ:** Nonlinear optimization (Pyomo, IPOPT), scenario analysis, sensitivity studies, probabilistic Monte Carlo simulation.
- **Scientific Programming:** Python (NumPy, SciPy, Pandas, Matplotlib), MATLAB; profiling, vectorization, modular pipeline design.
- **HPC/Workflow:** Batch-style parameter sweeps, reproducible environments, structured configs/logging, cloud HPC experience (AWS EC2).
- **Geospatial (supporting):** GDAL/geopandas/rasterio for spatial preprocessing, network/topology datasets.

EDUCATION

- **George Mason University** Fairfax, VA, USA
PhD in Earth Systems and Geoinformation Sciences (Advisor: Dr. Edward Oughton) Sep 2023 – Present
- **Selected Coursework:** Quantitative Methods; Applied Electromagnetic Theory; Atmospheric Physics; Computational Physics II; Digital Signal Processing; Spatial Computing.
- **GPA:** 3.85
- **Technical University of Kenya** Nairobi, Kenya
BEng in Aeronautical Engineering (First Class Honors) Sep 2013 – May 2019

RESEARCH EXPERIENCE

- **Graduate Research Assistant** George Mason University, VA, USA
Computational Modeling, Optimization, Scenario Studies May 2022 – Present
 - Developed computational models integrating numerical simulation, statistical scenario generation, and optimization to quantify infrastructure resilience and socio-economic impacts.
 - Built reproducible, multi-stage pipelines for hazard-to-impact studies (preprocess → simulation → postprocess → analysis).
- **Engineering Intern** Broglio Space Center, Malindi, Kenya
Satellite Operations, RF Systems Aug 2018 – Nov 2018
 - Supported satellite tracking and telemetry processing; assisted RF communications and operational data workflows.

SELECTED PROJECTS

- **C-SWIM:** Coupled Space Weather Impact Model — [C-SWIM](#)
 - End-to-end hazard-to-impact pipeline coupling space-weather scenario design, power-grid response modeling, and socio-economic impact estimation.
 - Designed workflows for repeated scenario runs and reproducible postprocessing; results dashboard: [space-weather-grid](#).
- **horton_grid:** Benchmark Test Grid for GIC Simulation — [horton_grid](#)
 - Reproduced and validated geomagnetically induced current simulation workflows on the Horton–Boteler (2013) test grid for benchmarking.
- **sat-model:** Space Environment Sensitivity + Fleet Impacts — [sat-model](#)

- Implemented modular analysis including radiation/SEE risk, orbital drag/propellant estimation (MSIS + SGP4), and capacity/economic impact workflows.
- **tfpy**: Frequency-Domain + Neural Approaches for GIC Prediction — [tfpy](#)
 - Implemented transfer-function baselines and neural architectures (CNN/GRU/LSTM with attention), including physics-informed modeling components.
 - Built evaluation and comparison scripts for storm-time datasets and reproducible analysis.

SELECTED PUBLICATIONS & PREPRINTS

- **A Physics-Engineering-Economic Model Coupling Approach for Estimating Socio-economic Impacts of Space Weather (Primary Author):** [arXiv:2412.18032](#) — Code: [C-SWIM](#) — Dashboard: [space-weather-grid](#)
- **A Reproducible Method for Mapping Electricity Transmission Infrastructure for Space Weather Risk Assessment (Co-Author):** [arXiv:2412.17685](#)
- **GIC-Related Observations During the May 2024 Geomagnetic Storm in the United States (Co-Author):** [arXiv:2507.07009](#)

PROFESSIONAL DEVELOPMENT

- **National Center for Atmospheric Research** Boulder, CO, USA
Early Career Faculty Innovators Program 2023 – 2025
- **African Institute of Mathematical Sciences** Cape Town, South Africa
Africa Data Science Intensive Program 2022

REFERENCES

Available upon request.