Alexander Lozinski

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- Postdoctoral scholar & lecturer at University of California, Los Angeles
- Expert in machine learning, physics-based modeling and data science
- UK citizen with permanent resident status (green card)

Education

Ph.D. Radiation Belt Physics, British Antarctic Survey & University of Cambridge   **2021**
Modelling the Exposure of Satellites in Medium Earth Orbit to Proton Belt Radiation
Advisors: Prof. Richard Horne & Dr. Giulio Del Zanna

MSc Physics, Imperial College London, *Pass with Distinction*   **2015**
Project thesis: *Modelling Magnetopause Reconnection at Saturn*

BSc Geophysics, Imperial College London, *First-Class Honours*   **2014**

Experience

Postdoctoral Scholar & Lecturer, Atmospheric & Oceanic Sciences, UCLA   **12/2022 - now**
Predictive modeling of Earth's radiation belts for better real-time space weather awareness:
- **numerical modeling** of energetic particle dynamics over multiple scales, from solving the individual equation of motion to evolving a distribution function;
- **artificial neural network**-based modeling in **Pytorch** & **sci-kit learn** for forecasting radiation belt phase space density, processing **large datasets** for training;
- spacecraft **radiation effect calculations** including monte carlo shielding simulations, solar cell nonionizing dose and internal charging of dielectrics;
- developed the TRIPS Python library for particle tracing and magnetic field analysis;
- **data assimilation** of spacecraft measurements into 3D physical model predictions

Radiation Belt Scientist, British Antarctic Survey, UK   **6/2021 - 11/2022**
Developed a real-time physics-based numerical model of Earth's proton radiation belt driven by spacecraft measurements for the UK Met Office. This work included modeling physical processes as empirical terms in a **3D Fokker-Planck equation**, developing an implicit solver and processing real-time measurements to specify an outer boundary condition.

Ground Systems Engineer, Avanti Comms., UK   **9/2015 - 01/2017** (prior to PhD)

Teaching

Instructor for Introduction to Machine Learning for the Physical Sciences   Fall 2023 - 2025

This course teaches seven of the most popular ML algorithms using scikit-learn and Google Colab. My classes compliment online lectures and focus on guided problem solving. I designed the final project component of the course, hold office hours, and write/grade assignments. One challenge has been encouraging students to make use of AI tools whilst preventing over-dependence; I organized faculty meetings to discuss this.

Other Skills

Experience coding in **Python, Fortran** and **C++**; technology for collaborative project management (**Jira**), development (**Git**), and deployment (**Docker**); ML libraries (**Pytorch, scikit-learn, tensorflow**); data science (**pandas**); understanding of API authorization flow, etc.

Publications

Lozinski et al. (2025), *Modeling the Internal Redistribution of Earth's Proton Radiation Belt by Interplanetary Shocks*, JGR: Space Physics, 130(6)

Lozinski et al. (2024), *Modeling Field Line Curvature Scattering Loss of 1–10 MeV Protons During Geomagnetic Storms*, JGR: Space Physics, 129(4)

Clilverd et al. (2024), *Improved Energy Resolution Measurements of Electron Precipitation Observed During an IPDP-Type EMIC Event*, JGR: Space Physics, 129(7)

Lozinski et al. (2021), *Modeling Inner Proton Belt Variability at Energies 1 to 10 MeV Using BAS-PRO*, JGR: Space Physics, 126(12)

Lozinski et al. (2021), *Optimization of radial diffusion coefficients for the proton radiation belt during the CRRES era*, JGR: Space Physics, 126(3)

Lozinski et al. (2019), *Solar cell degradation due to proton belt enhancements during electric orbit raising to GEO*, Space Weather, 17(7), 1059-1072

numerous conference talks, including *IRENE Space Radiation Modelling and Data Analysis Workshop* (5/20/2025) and *33rd Single Event Effects Symposium...* (SEEMAPLD, 5/14/2024)

References

Prof. Jacob Bortnik, AOS Department Chair, UCLA   jbortnik@gmail.com
Prof. Richard Horne, Science Leader, British Antarctic Survey   rh@bas.ac.uk