Jules van Irsel

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Education

Dartmouth College — Hanover, NH
Doctor of Philosophy in Physics — *Sep. 2019 – Present*

University of Calgary — Calgary, AB
Bachelor of Science (Honours), Major in Astrophysics, 4.00 — *Sep. 2014 – June 2018*

Southern Alberta Institute of Technology — Calgary, AB
Mechanical Eng. Tech. (Honours), Major in Design and Development, 4.00 — *Sep. 2012 – June 2014*

Professional Experience

Graduate Student — Hanover, NH
Dartmouth College – K. A. Lynch – (603) 646 9311 — *Sep. 2019 – Present*

- Approved thesis proposal: *Current Continuity in Auroral System Science: A 3D Modelling Approach to Current Closure in Non-Sheetlike Auroral Arcs*: Expected defense: May 2025
- Proposed, and selected for graduate funding from, NASA's ROSES-2022 FINESST solicitation: *Current Continuity in Auroral System Science: A 3D Modelling Approach to Current Closure in Non-Sheetlike Auroral Arcs*
- Aided in developing NASA's ROSES-2022 HLCAS proposal: *Geophysical Non-Equilibrium Ionospheric System Science* (GNEISS, PI: K. A. Lynch) sounding rocket mission
- Aided in developing NASA's MIDEX-2019 proposal and through its Phase A Concept Study Report: *Auroral Reconstruction CubeSwarm* (ARCS, PI: K. A. Lynch)
- Produced a catalog of multifluid ionospheric 3D plasma simulations using the Geospace Environment Model of Ion-Neutral Interactions (GEMINI, github.com/gemini3d)
- Developed tools for driving GEMINI from multi-sourced data products, as well as visualizing the resulting rich output data volumes (github.com/317lab/aurora_gemini)
- Vacuum/plasma tested and wrote the GSE software for Petite Ion Probes and oversaw their integration onto NASA's *Loss through Auroral Microburst Pulsations* (LAMP, PI: A. Halford) sounding rocket

Instrument Design and Assembly Assistant — Calgary, AB
University of Calgary – J. K. Burchill – (403) 220 8108 — *May 2018 – Aug. 2019*

- Mechanically and electrically redesigned the rocket Miniature Plasma Imager (rMPI) lowering its power consumption and introducing electron baffling
- Assisted in rMPI environment testing (vacuum, vibration, plasma, etc.) and oversaw its integration onto NASA's *Cusp-Region EXperiment 2* (C-REX 2, PI: M. Conde) sounding rocket
- Oversaw integration of rMPIs onto NASA's *VISualizing Ion Outflow via Neutral atom Sensing 2* (VISIONS 2, PI: D. Rowland) 2 sounding rocket

Research Internship — Calgary, AB
University of Calgary – J. K. Burchill – (403) 220 8108 — *May 2017 – Oct. 2017*

- Research project on ionospheric upflow in the topside F-Region
- Used ESA's Swarm's EFI data to perform a superposed epoch analysis using electron temperature enhancements (as a probe for electron precipitation) and ion vertical flow

Mechanical Design Engineer & MWD Technician — Calgary, AB
QCD Group of Companies – T. Russell – (403) 700 5355 — *May 2014 – Oct. 2014*

- Assembled, maintained, and serviced vertical shock absorbers used in Measurements While Drilling (MWD) technology
- Designed a first prototype of a bearing removal tool used in servicing the shock absorber

Publications

- van Irsel, J., Lynch, K. A., Mule, A., Zettergren, M. D., (2024), Generation of top boundary conditions for 3D ionospheric models constrained by auroral imagery and plasma flow data, *Journal of Geophysical Research: Space Physics*. Manuscript in preparation.
- Lynch, K. A., Erlandson, R., van Irsel, J. et al., (2024), *Auroral Reconstruction CubeSwarm: A 2019 Heliophysics Medium-Class Explorer Phase A Concept Study Section E* and *D*. Manuscript in prep.

Courses

ISR Summer School Virtual
Theory, concepts, and hands-on experiment design for incoherent scatter radars *Jul. 2020*

Machine Learning Virtual
Coursera course on *Supervised Machine Learning: Regression and Classification* *Dec. 2019*

Conferences

2024 CEDAR Workshop San Diego, CA
Poster: *Current Continuity in Auroral System Science: Data-Driven Auroral GEMINI Simulations*

2023 AGU Fall Meeting San Francisco, CA
Poster: *Current Continuity in Auroral System Science: Defining a Catalog of Auroral GEMINI Simulations*

2023 CEDAR Workshop San Diego, CA
Poster: *Current Continuity in Auroral System Science: Defining Electron Precipitation*

2022 AGU Fall Meeting Chicago, IL
Poster: *Auroral System Science: Determining Geophysical Boundary Conditions for Multifluid Volumetric Simulations of Auroral Arcs*

2022 CEDAR Workshop Austin, TX
Oral: *Two Threads for 3D Auroral Modelling: How to Drive and How to See*
Poster: *Auroral System Science: Multifluid 3D GEMINI Simulations of Auroral Arc Ionospheric Current Closure*

Fourth Swarm Science Meeting Banff, AB
Volunteering opportunity

Awards/Scholarships

NASA FINESST: Future Investigators in NASA Earth and Space Science and Technology 2022

NSERC USRA: Undergraduate Student Research Award (Declined) 2018

PURE Award: Program for Undergraduate Research Experience Award 2017

Skills Alberta: 4th place in Mechanical Computer Aided Design and Drafting 2012

Technical Skills

Software: Autodesk Inventor, Autodesk Showcase, Solidworks, Solidworks Visualize, Paraview, VisIt, Dipstrace

Programming Languages: Python, MATLAB, Mathematica, Fortran, HTML/CSS, C

Developer Tools: Git, VS Code, Windows Subsystem for Linux, high performance computing, multi-threading, Slurm Workload Manager, Portable Batch System

Other: Computer Aided Design, surface-mount soldering, prototyping, Geometric Dimensioning and Tolerancing