

Mykhaylo Shumko

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EDUCATION

Montana State University

Masters in Physics

Ph.D. in Physics

Dissertation topic: Connecting Microburst Precipitation to Its Scattering Mechanism

August 2014 - present

Awarded in May 2016

Awarded in December 2019

University of California, Santa Cruz

B.S. in Astrophysics.

Thesis topic: Dynamic studies of punch thorough protection of silicon strip detectors with laser-based charge injection system. <http://adap.ucsc.edu/theses/MikeShumkoThesis.pdf>

September 2010 - June 2014

EXPERIENCE

Space Sciences and Engineering Laboratory

Graduate Research Assistant/Postdoctoral researcher

September 2014 - April 2020

Bozeman, MT

- Operate the FIREBIRD-II CubeSats and developed the data pipeline to automatically process and upload new data to the internet within 24 hours. Data is located at <http://solar.physics.montana.edu/FIREBIRD-II/>
- Organized and led a Particle Precipitation Workshop at University of New Hampshire, April 17th-18th, 2019.
- Use Two Line Elements to generate ephemeris and IRBEM-Lib to generate magnetic ephemeris.
- Developed a conjunction toolkit, a software package for calculating magnetic conjunctions between spacecraft. Lists of past conjunctions are used for analysis, and future conjunctions to prioritize FIREBIRD-II data downloads
- Creating an automated temporal and spatial microburst catalogs from the AeroCube-6 dosimeter data. These catalogs will be used to calculate a spatial scale size distribution of > 35 keV microbursts.
- Analyzed and submitted a manuscript to GRL on a microburst scale size analysis using a simultaneous observation of a microburst with decaying bounces by the two FIREBIRD-II CubeSats.
- Developed a Python wrapper for IRBEM-Lib (<https://sourceforge.net/p/irbem/code/HEAD/tree/trunk/python/>).
- Created a database of microbursts observed with the FIREBIRD-II CubeSats, detected using a wavelet filtering and reconstruction.
- Used the microburst database to extract energy spectra and dispersion properties.
- Advised REU and undergraduate students.
- Programmed a Long Range (LoRa) Arduino software defined radio to transmit data from remote locations.
- Earned a Technician Class ham radio license.
- Co-director of Rocky Mountain Data Science Club.

Los Alamos National Laboratory

Summer student

June - July 2018

Los Alamos, NM

- Performed a sensitivity analysis of the Magnetic Electron Ion Spectrometer on the Van Allen Probes.
- Used Markov chain Monte Carlo samplers in a forward model to convert count rates into flux spectra.

The Aerospace Corporation

Graduate Intern

May - August 2017

El Segundo, CA

- Analyzed a microburst observed with RBSP and used resonant diffusion theory to conclude that the electron transport is not consistent with particle transport along single-wave characteristics (diffusion curves for monochromatic waves).
- Validated magnetic field model footprint error with IRBEM-Lib.

- Modeled parent particle reconstruction from daughter particles using 4-vectors.
- Tested Punch-Through Protection resistance and safe operating voltage of Low Resistance silicon strip detectors in silicon sensor Laboratory using DC voltage sweep.
- Laser Injection Studies on ATLAS-07 and ATLAS-12 strip detectors to determine sensor tolerance to large injected charges from beam losses. Used ROOT to process measured waveforms.

Big Bear Solar Observatory

Summers of 2011, 2012, and 2013

*Programmer & Researcher**Big Bear, CA*

- Analysed the performance of the PCO-EDGE Camera using IDL software to quantify non-linearity in intensity, readout noise and gain with a photon transfer curve, and fixed-pattern noise by image inspection.
- Created an IDL function to detect prominences above the solar limb.
- Developed a program which analyses multiple solar images and tracks individual prominences for multiple days.
- Constructed a photoelectric sensor housing used to measure turbulence in the atmosphere for the multi-conjugate adaptive optics upgrade.

PUBLICATIONS

- Co-author, Direct Observation of Sub-Relativistic Electron Precipitation Driven by EMIC Waves, submitted to GRL, June 2019.
- Author, Evidence of Microbursts Observed Near the Equatorial Plane in the Outer Van Allen Radiation Belt, published in GRL, July 2018 (DOI: 10.1029/2018GL078451).
- Author, Microburst Scale Size Derived from a Bouncing Packet Microburst Simultaneously Observed with the FIREBIRD-II CubeSats, published in GRL, July 2018 (DOI: 10.1029/2018GL078925)
- Co-author, Observations directly linking relativistic electron microbursts to whistler mode chorus: Van Allen Probes and FIREBIRD II, published in GRL, November 2017 (DOI: 10.1002/2017GL075001).
- Co-Author, Low-Resistance Strip Sensors for Beam-Loss Event Protection, published in November 2014. (DOI: 10.1016/j.nima.2014.05.089).

AWARDS

- NASA Earth and Space Sciences Fellowship, 2018, 2019.
- Vela Fellowship, 2018.
- The Best Inner Magnetosphere Poster, GEM Workshop, 2016.
- Montana Space Grant Consortium (MSGC) Fellowship, 2015 - 2016.
- NASA EPSCoR Travel Grant, 2015.

CONFERENCES, MEETINGS, AND WORKSHOPS

- Invited focus group talk and poster presenter, GEM workshop, June 24-28, 2019.
- Poster presenter, AGU Fall Meeting, Dec 10-14, 2018.
- Executive Secretary, NASA Review Panel, 2014, 2018.
- Gave a student tutorial, focus group speaker, and poster presenter, GEM workshop, June 17-23, 2018.
- Speaker, AGU Fall Meeting, Dec 11-15 Dec, 2017.
- Speaker, Relativity and Astrophysics Seminar, MSU, Sept 14, 2017.
- Invited speaker, Space Sciences Lab, UC Berkeley, Aug 15th, 2017.
- Gave a student tutorial, focus group speaker, and poster presenter, GEM workshop, June 18-23, 2017.
- Poster presenter, AGU Fall Meeting, Dec 12-16, 2016.

- Student, CISM Space Weather Summer School, July 11-22, 2016.
- Poster presenter, GEM Workshop, June 18-25, 2016.
- Speaker, MSGC Research Symposium, April 16, 2016.
- Speaker, Van Allen Probe ECT Teem Meeting, September 15-16, 2015.
- Poster presenter, CEDAR Workshop, June 21-26, 2015.

TEACHING EXPERIENCE

- Teaching Assistant, Physics 220, Intro to Physics I (w/ calculus), Spring 2016.
- Instructor, Physics 201, Physics by Inquiry, Fall 2015.
- Teaching Assistant, Physics 207, Intro to Physics II, Spring 2015, Summer 2015.
- Teaching Assistant, Physics 205, Intro to Physics I, Fall 2014.

TECHNICAL STRENGTHS

Computer Languages	Python, C and Assembly
Protocols	git, SSH and Samba Share
Tools	LaTeX, Visual Studio Code, Inkscape, Windows Subsystem for Linux
Languages	English and Russian

OTHER EMPLOYMENT EXPERIENCE

- Student Manager, UC Santa Cruz Cowell/Stevenson Dining Hall. September 2010 - May 2014.
- Bike Mechanic, UC Santa Cruz Bike Maintenance Clinic. April 2012 - June 2014.