

2026 Doctoral degree recipients affiliated with the Geophysical Institute

Michael Jason Ahrns

Ph.D. Space Physics

B.S., Arkansas Tech University, 2010.

Thesis: A Statistical Examination of Giant Auroral Undulations

This study examined conditions in which giant auroral undulations (GAUs) form, and what that implies about the physical mechanism causing them. Solar wind and interplanetary magnetic field conditions, geomagnetic conditions, and satellite and radar data point toward GAUs being formed under conditions of enhanced duskside convection through the auroral zone.

Major professor: Dr. Don Hampton

Mario Fernando Angarita Vargas *

Ph.D. Geophysics

B.S., Universidad de los Andes, 2013; M.S., Universidad de los Andes, 2017;

M.S., Universidad Nacional de Colombia, 2017.

Thesis: Reanalysis and (Near) Real-Time Inversion of Deformation Observations at Alaskan Volcanoes

This study develops a technique to quantify elevation changes using radar satellite imagery and an inversion framework to identify deformation sources. The results quantify morphological changes and constrain magma sources at Alaska volcanoes. For Shishaldin Volcano, these results are integrated with interdisciplinary data to constrain its plumbing system.

Major professor: Dr. Ronni Grapenthin

Cecilia Borries-Strigle *

Ph.D. Atmospheric Sciences

B.S., University of Illinois Urbana-Champaign, 2010;

M.S., University of Alaska Fairbanks, 2014.

Thesis: Seasonal Predictability of Sea Ice and Boreal Fire in Alaska

This dissertation evaluates the seasonal predictability of wildfire activity and September sea ice concentrations in Alaska. The research was conducted in collaboration with community partners to address critical challenges they face and to ensure that the resulting tools and insights are directly relevant to operational decision-making.

Major professor: Dr. Uma Bhatt

James Raemond Campbell *

Ph.D. Environmental Chemistry

B.S., University of Alaska Fairbanks, 2020.

Thesis: Understanding Secondary Atmospheric Chemistry in Extremely Cold and Dark Environments Through Hydroxymethanesulfonate (HMS) Measurements in Wintertime Fairbanks, Alaska

Fairbanks, Alaska, regularly exceeds PM_{2.5} air quality standards in winter. Secondary PM_{2.5} formation remains poorly understood in this urban environment. This research investigates hydroxymethanesulfonate, an aqueous-phase product in aerosols, to better understand secondary pollution processes and inform future mitigation strategies in cold and dark urban environments.

Major professor: Dr. Jingqiu Mao

Julian Dann **

Ph.D. Geophysics

B.A. Wesleyan University 2017; M.S. University of Alaska Fairbanks, 2023.

Thesis: Advancing Monitoring of Aueis: Science, Satellites, and Society in a Changing Arctic

The Arctic is warming, accelerating permafrost thaw and reshaping ecosystems and society. This dissertation advances Arctic science through improved aueis detection, regional trend analysis and reflections on community engagement. Results show seasonal declines in aueis persistence and highlight key strategies for fostering collaboration between large-scale research programs and Arctic communities.

Major professors: Dr. Simon Zwieback and Dr. Bob Bolton

Satyaki Das **

Ph.D. Atmospheric Sciences

B.E., NMAM Institute of Technology, 2016; M.S., Virginia Tech, 2019.

Thesis: Lidar and Radar Investigations of Gravity Wave Activity in the Middle Atmosphere at PFRR, Chatanika, Alaska

The middle atmosphere, spanning the stratosphere and mesosphere, plays a critical role in Arctic circulation, especially during sudden stratospheric warmings. This dissertation uses lidar and radar observations (2018–2022) to investigate temperature and wave dynamics, developing improved signal techniques and showing reduced gravity wave activity and vertical coupling that influence high-latitude circulation.

Major professor: Dr. Richard Collins

* Summer degree recipient

** Fall degree recipient

Victor Devaux-Chupin **

Ph.D. Geophysics

B.S., Grenoble Alps University, 2018; M.S., Grenoble Alps University, 2019.

Thesis: Ice Surface Change and Flow Dynamics Analysis of Sít' Tlein (Malaspina Glacier) Through Remote Sensing

This thesis investigates the dynamics of Sít' Tlein, the world's largest piedmont glacier, vulnerable to rapid retreat. It focuses on large, multidataset analysis to identify surge cycles, ice flow variability, and thinning processes. Results highlight complex ice dynamics impacting the glacier's extent and surface variations through time.

Major professor: Dr. Martin Truffer**Emily Jo Graves ****

Ph.D. Geophysics

B.S., Lake Superior State University, 2016;

M.S., University of Texas at El Paso, 2018.

Thesis: Multi-Scale InSAR Investigations of Anthropogenic and Natural Processes in the American Southwest

Surface deformation can be driven by variations in subsurface fluid pressure and other natural and anthropogenic processes. This dissertation produces and utilizes InSAR-derived average velocity fields and displacement time series to reveal and understand these multiscale processes, their interactions and impacts for a portion of the American Southwest.

Major professor: Dr. Ronni Grapenthin**Aakash Gupta ****

Ph.D. Geophysics

B.E., Jadavpur University, 2014;

M.Tech., Indian Institute of Technology Kanpur, 2016.

Thesis: Navigating Seismic Anisotropy, with Applications to Alaska

Seismic anisotropy characterizes how elastic waves travel through solid materials with different speeds, depending on the direction of the waves and the direction of particle motion of the waves. This dissertation provides steps taken towards addressing the larger goal of quantifying anisotropy in the Earth from crystal to whole-Earth scales.

Major professor: Dr. Carl Tape

* Summer degree recipient

** Fall degree recipient

Amanda Michelle McPherson

Ph.D. Geophysics

B.S., University of Alaska Fairbanks, 2016;

M.S., University of Alaska Fairbanks, 2018.

Thesis: Novel Applications of Seismic Source Estimation

Seismic source estimation is a fundamental tool of seismology and succinctly answers the question: why is the ground shaking? It is routinely applied to give information about the mechanism and size of an earthquake. This work applied the technique toward investigating airborne force sources, very-low-frequency earthquakes and seismic velocity models.

Major professor: Dr. Carl Tape**Nealey E. Sims ****

Ph.D. Geophysics

B.S., University of North Alabama, 2016.

Thesis: Earthquake Relocation, Fault Complexity, and Nucleation Patterns in Interior Alaska

Interior Alaska's diffuse but active intraplate seismicity obscures fault structures. Using matched filtering, cross-correlation and relocation, this work refines fault geometry, revealing segmented strike-slip systems and varied nucleation behaviors. The results clarify deformation processes and improve seismic-hazard understanding for Fairbanks and nearby infrastructure.

Major professor: Dr. Carl Tape**Austin Robert Smith**

Ph.D. Physics

B.S., Point Loma Nazarene University, 2020.

Thesis: The Role of Ionospheric Conductance for Magnetospheric Energy Dissipation and Transport at Earth and Jupiter

Magnetosphere-ionosphere coupling, controlled by conductance, governs planetary space environments. Modeling of Earth and Jupiter enables the comparison of different drivers of energy transport and dissipation. Solar insolation shapes Earth's ionospheric electron content and magnetospheric energy dissipation, while Jupiter's rapid rotation and internal plasma source regulates magnetospheric dynamics and temperature distribution.

Major professors: Dr. Peter Delamere and Dr. Doğan Öztürk

* Summer degree recipient

** Fall degree recipient

Darren Tan *

Ph.D. Geophysics

B.S., Nanyang Technological University, 2020.

Thesis: Toward Multidisciplinary Volcanic Eruption Models and Forecasts in Alaska:
Contributions from Automated Seismic and Acoustic Signal Detection

Explosive volcanic eruptions pose increasing risks to a globally connected population. Advanced detection, characterization and relocation techniques are applied to decades of seismic and infrasound data from Alaska volcanoes to build enhanced event catalogs. Integrated with multidisciplinary insights, these catalogs reveal unique unrest patterns, supporting volcano monitoring and eruption forecasts.

Major professor: Dr. David Fee**Valerie Kelly Wasser ****

Ph.D. Geoscience

B.S., University of Hawaii, 2017; M.S., University of Alaska Fairbanks, 2019.

Thesis: Characterizing Magmatic Processes at Pavlof and Augustine Volcanoes,
Alaska, Through Changes in Volatile, Melt, and Phenocryst Geochemistry

This study investigated magmatic processes by examining mineral compositional changes across dissolution surfaces in crystal clots at Augustine Volcano and changes in geochemistry between recent eruptions, as well as volatile concentration changes in melt inclusions during magmatic ascent at Pavlof Volcano.

Major professor: Dr. Taryn Lopez**Tianlang Zhao ****

Ph.D. Environmental Chemistry

B.S., Nanjing University of Information Science & Technology, 2018.

Thesis: Understanding the Sources and Variability of Air Pollution in Northern High
Latitudes: Using Formaldehyde (HCHO) as a Tracer

Formaldehyde (HCHO) variability across the Arctic was quantified using satellites and models. Wildfires emerged as the predominant driver of pan-Arctic interannual HCHO variation, and a new algorithm was developed to estimate associated surface particulate pollution. Across North America, HCHO diurnal cycles were characterized to reveal regional photochemical processes.

Major professor: Dr. Jingqiu Mao

* Summer degree recipient

** Fall degree recipient