



Regional Introduction to Plasma Processes



Project Title: Electron aurora driven by chorus waves in the Earth's inner magnetosphere

Project Reference Code: Huayue_Chen-Auburn

Name of Project Leader: Huayue Chen

Host Facility: Auburn University

Internship Location: Leach Science Center, Suite 2158

Host Facility Location: 380 Duncan Drive, Physics Department, Auburn University, Auburn, AL 36849

Project Description:

Electron auroras are produced by the precipitation of electrons with energies ranging from tens to hundreds of keV, manifesting as large-scale luminous regions and irregular patches in the Earth's ionosphere. These auroras are thought to be generated through particle scattering caused by chorus waves in the inner magnetosphere. However, the underlying physical processes are not yet fully understood. Current studies on their generation mechanisms mainly rely on test particle simulations, which ignore the feedback from particles to waves. Notably, electrons in the tens of keV range are crucial for chorus wave excitation, causing previous studies to underestimate auroral intensity. In this project, we aim to recruit students to conduct self-consistent simulations to investigate the mechanisms of auroral generation and quantify the dominant controlling factors.

Disciplines: Space physics, plasma physics

Importance:

Studying electron auroras helps to better understand the dynamics of energetic particles and how the energy is transferred from the magnetosphere to the ionosphere. For example, aurora can modify the electrical and optical properties of the ionosphere, thereby influencing radio wave propagation, communication, and navigation systems.

Requirements:

- **Preferred Major**
 - Physics
 - Computer science
- **Class work**
 - Plasma physics
- **Programming knowledge**
 - Basic coding background in any language, but not required.
- **Software knowledge**
 - IDL is preferred, with knowledge of MATLAB and/or Python considered a plus.
- **Other**

Biography:

I am working in the Physics Department at Auburn University. My research interest is satellite observation and numerical simulation on wave-particle interactions in the Earth's magnetosphere.



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Is U.S. citizenship required to participate in this project? No

Contact information: Huayue Chen, hzc0129@auburn.edu

Name(s) of Mentor(s) and contact information: Huayue Chen, hzc0129@auburn.edu

Internship Coordinator/ HR manager: Saikat Chakraborty Thakur, (szc0199@auburn.edu) and Mary Prater (mlp0077@auburn.edu)

The name and contact information of personnel at the host facility is provided for further assistance with questions regarding the host facility or the project.

Interns will not enter into an employee/employer relationship with the host facility. No commitment with regard to later employment is implied or should be inferred.