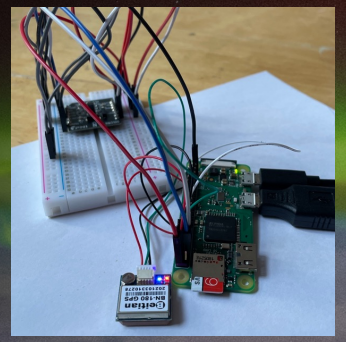
EZIE

Electrojet Zeeman Imaging Explorer

The EZIE mission reflects the timely convergence of a new compact sensor technology and the emergence of high-heritage CubeSats to provide insight into decade old mysteries surrounding the aurora

OUTREACH



Inputs	Activities	Outputs	Outcomes	Long-Term Benefits
• 20 institutional partners • APL communications resources • Existing NASA outreach infrastructure • EZIE subject-matter experts • Existing heliophysics data and NASA resources • EZIE data including SuperMAG Network	• 1000 MagPi kits with guides and videos • AR enhanced scale models of the EZIE spacecraft • NASA Space Apps Challenge • APL Central Spark events, APL summer camps, subject-matter expert sessions, workshops • Social media campaigns	• Over 300,000 diverse participants will experience heliophysics-related STEM outreach through the EZIE activities. • The MagPi program will involve over 1000 indigenous outreach facilitators via existing APL and NASA networks.	• Inspire diverse participants and involve them in heliophysics science events and resources • Provide a STEM path for underserved audiences • Increase experience and knowledge in outreach and communications among subject-matter experts	• NASA STEM workforce grows more diverse/inclusive • NASA subject-matter experts effectively and efficiently engage in outreach through events and products • APL outreach fosters cross-cultural understanding and greater social equity

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THE SCIENCE

What?

- EZIE will image the magnetic signature of the ionospheric electrojets and reveal the underlying processes.
- Electrojets are electrical currents related to the aurora.

How?

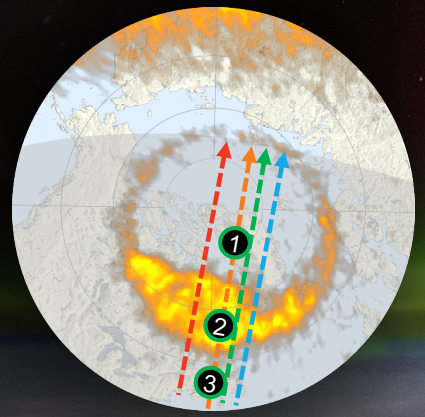
- Three identical CubeSats will be deployed in a pearls-on-a-string, sun-synchronous polar orbit.
- Each CubeSat will provide four simultaneous remote sensing vector magnetic field measurements using the Zeeman splitting of the atmospheric O_2 thermal emissions.
- Each orbit provides three maps of the electrojet current, one per CubeSat, to reveal spatial structure and temporal evolution.

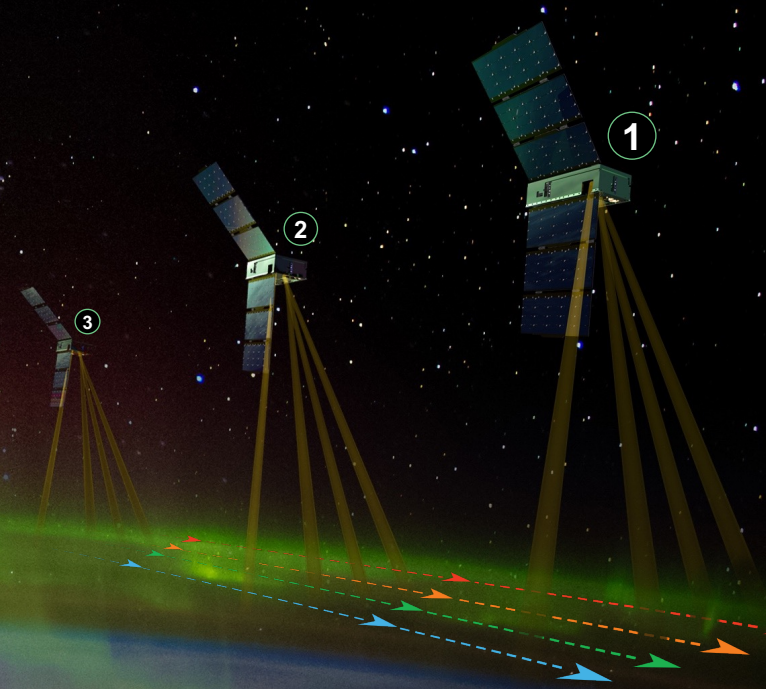
Why?

- EZIE will uncover physics required for better prediction of space weather, which impacts our increasingly technological society.

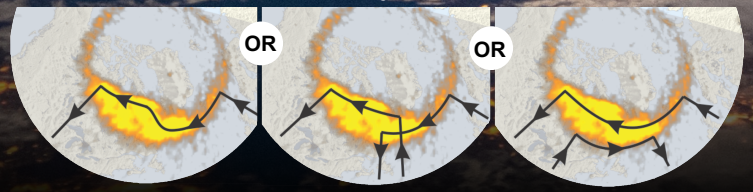
Science Questions

- EZIE will test competing and much debated hypotheses regarding the current circuit linking Earth and near-space.

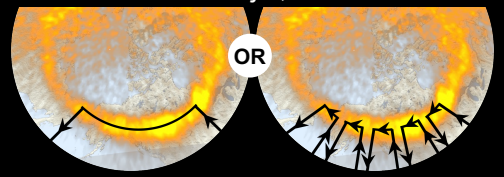


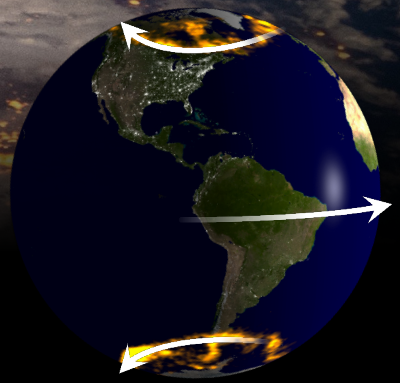


Auroral Electrojet, Question 1

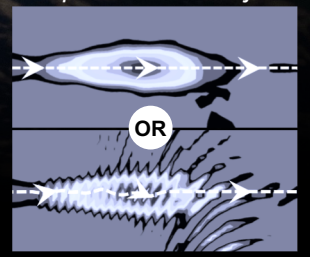


Auroral Electrojet, Question 2





Equatorial Electrojet



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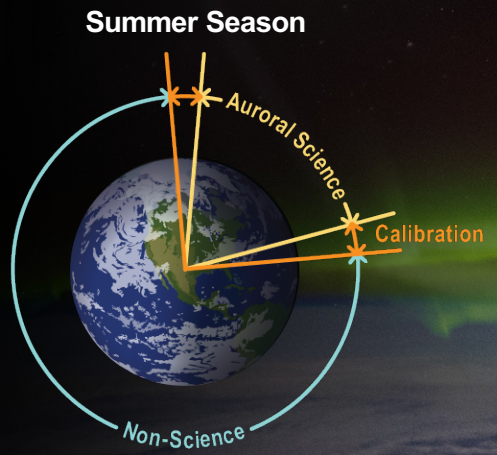
THE MISSION

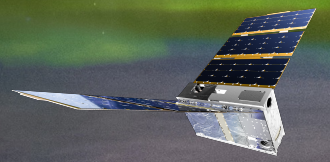
At a Glance

- Measurements of the structure and evolution of the ionospheric electrojets will resolve decades-old mysteries regarding the vast Earth–Space electrical current circuit.
- Each CubeSat carries a compact Microwave Electrojet Magnetogram (MEM) instrument that uses the Zeeman effect to infer magnetic fields at ~80-km altitude, close to the source current.
- Differential drag maneuver techniques demonstrated on past missions provide the desired along-track separation.
- High-heritage designs will deliver a mission with high science impact at low cost and low risk.
- Mission architecture provides high resilience to unplanned scenarios.



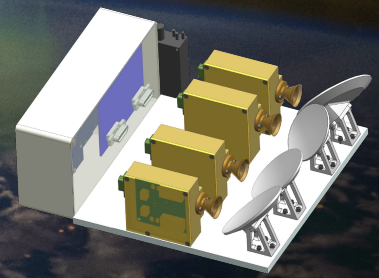
Each orbit has three modes:

- *Science (pointing nadir)*
- *Calibration (pointing to cold space)*
- *Non-Science (communications, drag, & charging)*

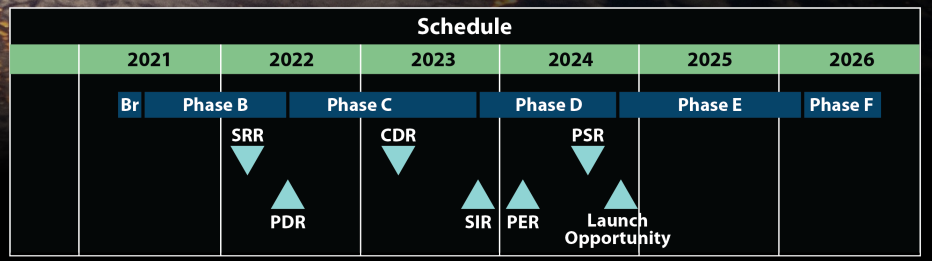


1.1 m & 12 kg mass

6U-CubeSats have flight-proven performance from previous missions.



The MEM provides 4 simultaneous vector magnetic field measurements.



Launching in fall 2024, EZIE has robust schedule reserves.

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