Auroral Reconstruction CubeSwarm

ARCS Mission

- A constellation of 32 CubeSats in concert with ground-based imagers, RF-transmitters, and state-of-the-art physics models to decode the aurora
- Unveiling the relationship between the visible aurora and invisible currents and plasma flows to unlock critical physics of the dynamic auroral ionosphere

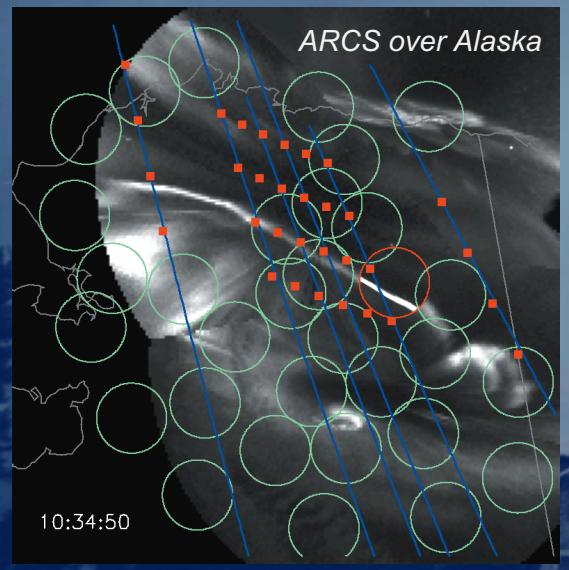


Photo by J. Ahrns, UAF/GI

APL Contributions

APL is vital to ARCS mission leadership, instrumentation, and scientific discovery.

- Crucial scientific expertise in ionospheric physics, electrodynamics, and multi-point measurements.
- Scientific instruments for each of the ARCS CubeSats:

Magnetometer (MAG)

Recording the magnetic field and currents

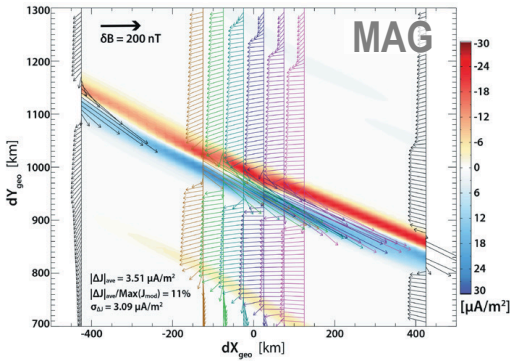
- 32 tracks of data create a map of magnetic field patterns, which allow us to map auroral electric currents *(top right)*
- MAG combines with plasma velocities to map the electromagnetic energy flow in the auroral ionosphere

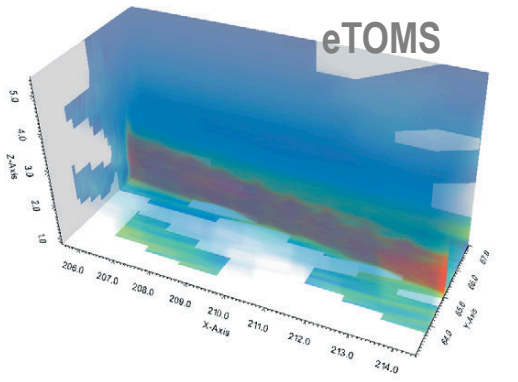
Electron-density Tomography and Scintillation receiver (eTOMS)

Sensing electron density and irregularities

- Dual-frequency receivers (on 32 CubeSats) and 22 ground transmitters generate a high-resolution 3D map of the electrons in the ionosphere and auroral arcs *(bottom right)*
- Revolutionary approach to track electron density and effects of irregularities on ray path signals in the auroral ionosphere

ARCS Reconstruction Maps





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