

# University of Alberta space research to solve aurora mystery

January 10 2007

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On February 15, NASA will launch the largest number of scientific satellites ever sent into orbit aboard a single rocket. A handful of Alberta scientists will be at Kennedy Space Center watching and waiting. For Dr. Ian Mann and Dr. John Samson, researchers in the Department of Physics at the University of Alberta, the real fun will begin when the satellites start taking measurements in the eye of space storms above observatories spread across North America.

The satellites, all carrying identical suites of electric, magnetic, and particle detectors, are part of the NASA THEMIS mission (for "time history of events and macroscale interactions during substorms"). THEMIS is a collaborative effort of scientists from the US, Canada and Europe that will study processes occurring in near-Earth space and elsewhere in the universe.

Mann, a THEMIS co-Investigator and Canada Research Chair in Space Physics says "with an unprecedented flotilla of five research satellites flying in formation we will discover for the first time how energy release is triggered in extreme space weather events."

Given the vulnerability of satellites to fluxes of energetic particles, the results will help scientists better understand how to protect them during near-Earth space storms. A beautiful and fascinating side benefit of this project will be discovering why the most spectacular auroral displays look the way they do.

Auroras are powered by solar wind - a stream of charged particles expelled by the sun. This wind blows past the earth at about 400-700 km per second and generates storms in the earth's magnetic environment. In the polar regions, these explode into spectacular auroral displays.

"By studying these explosions in the natural laboratory of near-Earth space, we can also learn how energy is explosively released in magnetised astrophysical objects in the universe. This also has important implications for magnetic confinement in nuclear fusion power reactors" adds Mann.

The THEMIS satellites will fly in carefully coordinated orbits, and every four days, will line up over Canada along the Earth's magnetic tail to track disturbances in near-Earth space in the magnetosphere.

Satellite data from the THEMIS mission will be compared to observations from ground stations across the Canadian Arctic. Since most of the readily accessible land under the northern-hemisphere auroral zone is in Canada, 16 of the 20 ground-based observatories will be set up in Canada, with the other four in Alaska. The observatories will host magnetometers which will monitor the magnetic signatures of explosions in near-Earth space known as substorms, as well as automated all-sky cameras.

Magnetometer data at some of the THEMIS ground-based observatory sites will be provided by the CARISMA (Canadian Array for Real-time Investigations of Magnetic Activity) magnetometer array. Dr. Mann is the Principal Investigator of CARISMA, operated by the University of Alberta and funded by the Canadian Space Agency. A \$1.3M expansion of the CARISMA array was recently funded by CFI.

Data collected from the observatories and the THEMIS satellites will be analyzed by teams of scientists at the University of Alberta working with

Dr's Mann and Samson. Data from the THEMIS mission will be made available over the internet using the computing facilities at the University of Alberta in a project led by Dr. Robert Rankin in the Physics Department.

Source: University of Alberta

Citation: University of Alberta space research to solve aurora mystery (2007, January 10)  
retrieved 2 May 2024 from

<https://phys.org/news/2007-01-university-alberta-space-aurora-mystery.html>

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