Western University
DEPARTMENT OF PHYSICS AND ASTRONOMY

PHYSICS & ASTRONOMY COLLOQUIUM

Date: TUESDAY, 29th October 2013
Time: 1:30 p.m.
Location: Physics & Astronomy Seminar Room 100

Dr. Eric Donovan
Department of Physics and Astronomy
University of Calgary

“Using the Aurora to Remote Sense Plasma Processes in Near-Earth Space”

ABSTRACT

Our sun’s hot atmosphere is continuously expanding outwards, forming the solar wind. Earth’s magnetic field carves a cavity out of the solar wind that we call the magnetosphere. Bounded at its base by the atmosphere, the magnetosphere sits like a giant windsock in the solar wind. Magnetoospheric dynamics are exemplars of astrophysical phenomena in our plasma-filled Universe, and as fundamental processes impossible to recreate in labs. They are of practical import, since space weather affects climate, aircraft communication, and global navigation satellite systems including GPS.

A famous by-product of magnetospheric dynamics is the aurora. Similar to how an image is formed on a TV screen, the aurora is a projection of magnetospheric dynamics. Auroral observations provide a powerful way of remote sensing the magnetosphere. Earth’s magnetic field and the solar wind determine where the aurora most often occurs, and the vast majority of land under the auroral zone is in Canada. Our “Canadian advantage” provides us a world-unique view into near-Earth space.

My team has built up an extensive auroral imaging system spanning all of Canada. In this talk, I will introduce the physics of the aurora and how its spatio-temporal structure relates to processes further out in space. I will focus on one such process, the substorm, which is a cycle of storage of energy in the magnetosphere and its explosive release to the atmosphere. Finally, I will show how our observations have been used to investigate the plasma instability responsible for this explosive release of energy.

Figure: A mosaic of the aurora over Canada created by stitching together images from ten ground-based panchromatic (white light) imagers operated by the University of Calgary as part of NASA’s Time History of Events and Macroscale Interactions in Substorms (THEMIS) mission.

Refreshments will be available.