

**YORK UNIVERSITY  
DEPARTMENT OF EARTH & SPACE SCIENCE & ENGINEERING  
and  
THE CENTRE FOR RESEARCH IN EARTH AND SPACE SCIENCE**

## **SEMINAR**

**Dr. Wayne F.J. Evans, FRSC  
Adjunct Professor of CRESS, York University**

### **The Discovery of Meteoritic Metal Oxides in the Night Airglow**

#### **ABSTRACT**

The night airglow layer at 100 km is powered by chemiluminescent reactions involving the recombination of atomic oxygen into molecular oxygen. The identification of new airglow features in the earth's atmosphere will be presented. The FeO orange band system has been detected in the night airglow spectrum with the OSIRIS spectrograph on the ODIN spacecraft. The orange chemiluminescent airglow has been measured in the spectral region from 530 nm to 650 nm. At the spectral resolution of OSIRIS, the band systems of FeO appear as a continuum-like feature in the 600 nm region peaked at 86 km altitude in the upper mesosphere. A comparison of the observed spectrum feature with laboratory measurements of the FeO emission spectrum positively identifies FeO\* from the reaction of iron and ozone as the source of the orange airglow feature. The same orange feature has been observed in the afterglow of meteorite trains. The measured altitude profiles of the FeO feature were compared with altitude profiles of the atomic sodium emission and OH emission bands in the same OSIRIS spectrum; all three of these profiles are similar. This comparison indicates that the laboratory excitation mechanism is atomic iron with ozone since all three emissions originate from the reaction of atoms with ozone. A similar analysis has revealed the presence of nickel oxide in the airglow spectrum by observations of the blue bands of NiO\* in the 450 to 550 nm region. NiO has a similar altitude profile to FeO indicating that it originates from the reaction of Ni with ozone. Both metals coexist in iron meteorites and should be present in the airglow of Mars. The problems encountered in the observation of other expected meteoritic metal oxides such as MgO and CrO will be discussed.

Refreshments will be served.

**DATE:** Wednesday, February 1st, 2012  
**TIME:** 3:30 p.m. to 5:00 p.m.  
**LOCATION:** Room 317, Petrie Science and Engineering Building