



## HAO Colloquium Series

(Refreshments served)

**Speaker:** Ingrid Cnossen, HAO

**Time:** 1:30–2:30 pm

**Date:** Wednesday, October 5, 2011

**Location:** CG1-\*Room 2126\*

**Title:** The effects of changes in the Earth's magnetic field on the coupled magnetosphere-ionosphere-thermosphere system

### **Abstract:**

The Earth's magnetic field changes over time, and we are currently at a time of relatively strong change. The magnetic dipole moment has been decreasing at a rate of 5-7% per century since 1840, with little change before since 1590. The positions of the magnetic poles have also been changing, with the north magnetic pole moving at its fastest rate recorded to date, 40-60 km/year, during the last decade. Changes in the Earth's magnetic field affect the upper atmosphere, and in particular the ionosphere, where they contribute to observed long-term trends. To understand these long-term trends, we need to understand how the magnetic field influences the upper atmosphere, and to quantify these effects.

We have started this effort by performing exploratory simulations with the Coupled Magnetosphere-Ionosphere-Thermosphere (CMIT) model, initially focusing on just the effects of a change in field strength, while keeping the orientation fixed. We performed simulations with a dipole moment of  $8 \cdot 10^{22}$  Am<sup>2</sup>, close to the present-day value, and a dipole moment of  $6 \cdot 10^{22}$  Am<sup>2</sup>, both under the same solar wind conditions, intermediate solar activity (F10.7 = 150), and for March equinox and June solstice. I will present the results of those simulations and discuss the responses of the coupled magnetosphere-ionosphere-thermosphere system to the 25% reduction in field strength.

Changes in the Earth's magnetic field may also affect geomagnetic activity. If the long-term geomagnetic activity record is to be used to gain information about long-term change in the Sun, such effects need to be corrected for. I will also present preliminary results from CMIT simulations on the effects of magnetic field changes over the past century on geomagnetic activity.