HAO Colloquium Series

(Refreshments served)

Speaker: **Eric Sutton, AFRL**

Time: **10:30–11:30 am**

Date: **Thursday, August 8, 2013**

Location: **CG1-2139 Captain Mary**

Title: **The Role of Helium in the Thermosphere During Recent Solar Minima**

Abstract:

The previous solar minimum exhibited sustained low levels of solar extreme ultraviolet radiation and geomagnetic activity. This affords the opportunity to study upper-atmospheric conditions that are outside the domain of the available historical data and empirical models of the thermosphere. With the decline of solar and geomagnetic activity, neutral helium becomes dominant at progressively lower altitudes. We present a new physics-based model of thermospheric composition – an extension of TIE-GCM – that includes the transport and dynamics of neutral helium as a major constituent. Previous models have included helium as a minor constituent, simulating the effect of the major constituents on helium while ignoring the reverse; however, we find that these assumptions limit the model to non-solar minimum conditions and/or lower altitudes. The main effect of helium in the thermosphere is a seasonal modulation of the mean molecular weight. The decrease in the mean molecular weight and accompanying increase in scale height in the winter hemisphere, where helium is more densely concentrated, cause an increase in the geopotential height of the pressure surfaces. This effect further couples into the momentum equations where a difference of >20 m/s directed away from the winter helium bulge is observed.