Speaker: Lucas Tarr, Montana State University
Time: 1:30–2:30 pm
Date: Wednesday, May 14, 2014
Location: CG1 – 1210 South Auditorium (also webcast at http://www.fin.ucar.edu/it/mms/cg-live.htm)
Title: Reconnection of an emerging flux region with a magnetic dome topology

Abstract:
When magnetic flux emerges from beneath the photosphere it displaces the preexisting field in the corona, and a current sheet forms at the boundary between the old and new magnetic domains. Reconnection in the current sheet relaxes this highly stressed configuration to a lower energy state. This scenario is most familiar, and most often studied, in flares, where the flux transfer is rapid. I will present a study of steady, quiescent flux transfer occurring at a rate three orders of magnitude below that in a large flare. In particular, I quantify the reconnection rate, and related energy release, occurring as new polarity emerges to form NOAA Active Region 11112 (\textsf{SOL16 October 2010T00:00:00L205C117}) within a region of preexisting flux. A bright, low lying kernel of coronal loops above the emerging polarity, observed with the \texttt{Atmospheric Imaging Assembly} onboard the \texttt{Solar Dynamics Observatory} and the \texttt{X-ray Telescope} onboard \texttt{Hinode}, originally shows magnetic connectivity only between regions of newly emerged flux when overlaid on magnetograms from the \texttt{Helioseismic and Magnetic Imager}. Over the course of several days, this bright kernel advances into the preexisting flux. The advancement of an easily visible boundary into the old flux regions allows measurement of the rate of reconnection between old and new magnetic domains. We compare the reconnection rate to the inferred heating of the coronal plasma. We determine that the newly emerged flux reconnects at a fairly steady rate of $0.38 \times 10^\text{16} \times Mx \times s^{-1}$ over two days, while the radiated power varies between $2 \times 10^\text{25} \times \text{ergs} \times s^{-1}$ over the same time, indicating that the current in the current sheet is increasing. As much as $40\%$ of the total emerged flux at any given time may have reconnected. The total amount of transferred flux ($\sim 10^\text{21} \times Mx$) and radiated energy ($\sim 10^\text{30} \times \text{ergs}$) are comparable to that of a large M- or small X-class flare, but are stretched out over 45 hours.