HAO Colloquium Series
(Refreshments will be served)

Speaker:  Aimee Norton, Stanford University
Time:     1:30–2:30 pm
Date:     Wednesday, September 10, 2014
Location: CG1 – 2126 (also webcast at http://www.fin.ucar.edu/it/mms/cg-live.htm)
Title:    North-South Asymmetries: the Solar Dynamo and Hemispheric Coupling

Abstract:

The observed limits on solar cycle hemispheric asymmetry show that hemispheric differences in
sunspot area production are no more than 20% asymmetric for cycles 12-23 and that phase lags do not
exceed 20% (or two years) of the total cycle period, as determined from Royal Greenwich Observatory
sunspot data. Several independent studies have found a long-term trend in phase values as one
hemisphere leads the other for, on average, four cycles. Such persistence in phase is not indicative of a
stochastic phenomenon. We compare the observational findings to the magnetic cycle found in a
numerical simulation of solar convection recently produced with the EULAG-MHD model. The
suspected mechanisms of hemispheric coupling include magnetic diffusion, cross-equatorial mixing
within latitudinally-elongated convective rolls (a.k.a. “banana cells”) and trans-equatorial meridional
flow cells. One or more of these processes may lead to coupling, but the strong symmetry of the
butterfly diagram indicates that a more active coupling of the hemispheres is occurring at depth. Most
likely, an active magnetic flux cancellation occurs late in the solar cycle whereby the oppositely
directed flux toroids come in close proximity and cancel each other across the magnetic equator. We
take a close look at the pattern of magnetic flux that erupts near and/or crosses the geometric equator
for signs of this.