Speaker: Fang Fang, HAO

Date: Wednesday, October 15, 2014

Time: 1:30–2:30 pm

Location: CG1 – 2139 Captain Mary (no webcast or recording will be available)

Title: Coronal Responses to Magnetic Flux Emergence in Numerical Simulations

Abstract:

Solar magnetic fields permeate various layers of the Sun, from the interior to the corona, and interact with the local plasma. The physical properties of the plasma vary drastically, from the convection zone to the corona, and the interaction between the plasma and magnetic fields strongly distorts the field structure during the emergence. The emerged fields dominate the dynamics in the corona and may drive magnetic eruptions, with significant release of magnetic energy into thermal and kinetic energy of the plasma. Here we present a series of numerical simulations of flux emergence in a coupled convection-zone-corona system, and study the response of the coronal fields. Simulation of a smaller scale shows that during the eruption of a blowout jet, untwisting field lines drive spinning outflows of the dense plasma in the jet, at a rotating speed of 20 km/s matching observations. To the larger-scale end, simulation of flux emergence in the active-region-scale domain shows the formation of delta-sunspots with two pairs of dipoles forming on the surface yet underneath originating from the same twisted flux rope. Expansion and rotation of the emerging dipoles drive two opposite polarities into each other, with highly sheared magnetic and velocity fields at the polarity inversion line. Reconnection occurs at the PIL and creates remarkable complexity in the coronal fields, comparable with the observed coronal loops in AR11158.