MONTANA STATE UNIVERSITY | College of LETTERS & SCIENCE — Physics Colloquium

Friday, October 28, 2016
4:10 – 5:00 PM
Barnard/EPS 103

Electric Fields on the Sun:
How Can We Determine Them and Why Should We Care?

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Abstract:

The most violent space weather events (eruptive solar flares and coronal mass ejections) are driven by the release of free magnetic energy stored in the solar corona. Energy can build up on timescales of hours to days, and then may be suddenly released in the form of a magnetic eruption, which then propagates through interplanetary space, possibly impacting the Earth's space environment. Can we use the observed evolution of the magnetic and velocity fields in the solar photosphere to model the evolution of the overlying solar coronal field, including the storage and release of magnetic energy in such eruptions? The objective of CGEM, the Coronal Global Evolutionary Model is to develop and evaluate such a model for the evolution of the coronal magnetic field. The primary innovation of the CGEM data-driven model, as compared to the majority of current generation of coronal field models that are constrained to match the surface magnetic field, is the ability of CGEM corona to support electric currents generated inductively by electric fields, thereby allowing for a consistent energy buildup process in the corona. I will describe the electric field inversion technique we use to estimate photospheric electric fields in CGEM and present its recent applications to estimate energy flux evolution in an evolving active region and to drive the time-dependent coronal magnetic field. I will then show how the evolving coronal magnetic fields are used as a starting point for magnetohydrodynamic (MHD) models of the corona, which can then be used to drive models of heliospheric evolution and predictions of magnetic field and plasma density conditions at 1AU. In the end I will discuss the current status of CGEM, its future and applications.

Host: Jiong Qiu

****** Refreshments served in the EPS second floor atrium at 3:45 ******