



HAO Colloquium Series

(Refreshments served)

Speaker: Seth Claudepierre, The Aerospace Corp, LA

Time: 1:30–2:30 pm

Date: Wednesday, February 8, 2012

Location: CG1-South Auditorium

Title: Global MHD Simulations of Magnetospheric Field Line Resonances and Waveguide Modes

Abstract:

Solar wind driving of the Earth's magnetosphere is investigated with the Lyon-Fedder-Mobarry (LFM) global, 3D, single-fluid magnetohydrodynamic (MHD) simulation code. We explore the role that solar wind dynamic pressure fluctuations play in the generation of magnetospheric ultra-low frequency (ULF) waves, using idealized solar wind configurations to drive the MHD simulations. In this numerical experiment, we impose both monochromatic and quasi-broadband dynamic pressure fluctuations in the Pc3–5 ULF range on the magnetosphere (~ 0 –30 mHz). We find both toroidal mode field line resonances (FLRs) and waveguide modes in the magnetospheric response, consistent with well-established mode coupling theory [e.g. Chen and Hasegawa, 1974; Kivelson and Southwood, 1985]. The overall features of the simulated resonances are in agreement with commonly observed ULF wave characteristics. To the best of our knowledge, these results are the first to explicitly and unambiguously reproduce inner magnetospheric resonances using a global MHD simulation of the solar wind magnetosphere interaction. When compared with previous ULF modeling studies [e.g. Lee and Lysak, 1989], the realistic geometry of the LFM magnetosphere and its interaction with the solar wind provides a more accurate, global representation of ULF waves in the coupled solar wind magnetosphere-ionosphere system.