
EAPS Planetary Lunch Colloquium Series (PICS)

Kimberly M. Moore

Graduate Student

Harvard University

Tuesday, October 24th

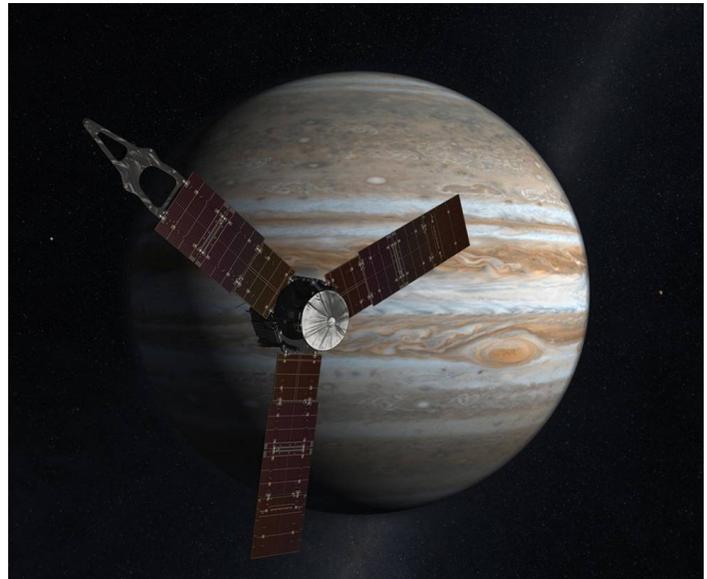
12:30pm

54-517

Sparse math methods for planetary magnetic field analysis: Results from Mars & NASA Juno

Sparse math methods have revolutionized many fields, from genetics to image processing. Here I use sparse methods to find the minimum percent of Mars' surface that must be magnetized in order to fit NASA Mars Global Surveyor Data. I do so by seeking sparse representations of the crustal field, in other words, representations for which the magnetization at each point on a surface grid is identically zero unless the data demands otherwise. I employ an L1 regularization, in contrast to L2 regularizations which tend to produce smoothed solutions. I find only 15% or less of Mars' surface needs to be magnetized to explain the data.

The NASA Juno spacecraft is in a near polar orbit around Jupiter that comes to within $1.06 R_J$ of the planet's center—much closer than any previous mission. Thus each orbit of Juno has very high resolution along track, but off-track resolution is limited to a narrow band in longitude. I present a method that provides a high-resolution window into Jupiter's magnetic field along each spacecraft track. The structure I obtain suggests the possible presence of both equatorial spots (as might result from flux expulsion), and low polar flux (as might result from the effect of a tangent cylinder).



For more information, contact John Biersteker (jo22395@mit.edu)