Space Science Seminar
Tuesday, 2014 October 14
10:30 a.m.
NSSTC/2096

Charge Exchange Induced X-ray Emission in the Solar System and Beyond

Dr. P.C. Stancil/University of Georgia, Athens, Department of Physics and Astronomy and the Center for Simulational Physics

X-ray astronomy is a relatively new field, which began by putting detectors above the atmosphere on balloons and sounding rockets more than fifty years ago. These early glimpses revealed X-ray emission from space in all directions. Today the field is mature with three operating space telescopes (Chandra, XMM-Newton, and Suzaku), but technological challenges still limit wavelength resolution, which in turn hampers scientific understanding. X-ray emitting environments typically are classified as being either in collisional ionization equilibrium (CIE) or photoionization equilibrium (PIE) with the ionization being driven by electron collisions or some high-energy photon source, respectively. Within the last decade, X-ray astronomers began to consider a third mechanism, charge exchange (CX) due to the collision of highly charged ions with neutrals. This was a direct result of unexpected X-ray emission observed in the late 1990s from comets, planetary exospheres, and the heliosphere which is primarily attributed to CX. However, it is highly likely, the emission from extra-solar astrophysical sources involve at least two, if not all three, of the above mechanisms, so that disentangling the various contributions is fraught with huge uncertainties. In this talk, I'll review the status of X-ray emission modeling focusing on the astrophysics and atomic physics of CX and related collisional processes.

http://solarscience.msfc.nasa.gov/colloquia/