Michigan Institute Plasma Science and Engineering Seminar

Neutral Atom Imaging of the Terrestrial Magnetosphere

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Joint Seminar - Dept. Atm. Oceanic & Space Sci.

Abstract

During the 1980's and 90's, researchers proposed imaging magnetospheric plasmas in energetic neutral atom (ENA) emission. Instead of measuring photons, neutral atom cameras angularly resolve neutral atom fluxes emitted by hot plasmas. The magnetospheric IMAGE spacecraft was launched in 2000 with 3 ENA imagers. With medium energy ENA data, we remotely measured the ion temperature (T_{ion}) of the terrestrial magnetosphere during strong geomagnetic activity. Imaging during quiet intervals is more difficult. In this talk, I will show that with many days of ENA data from the IMAGE and TWINS spacecraft, neutral atom images and T_{ion} maps of the quiet time magnetosphere can be created. The quiet-time magnetosphere shows remarkable structure and thermal asymmetry. With a superposed-epoch analysis of multiple storms, T_{ion} can be imaged through a geomagnetic storm. For very large storms, it is also possible to create T_{ion} images of the magnetotail out to -60 Earth radii. The remotely determined temperatures are consistent with in situ measurements from geosynchronous spacecraft; although there are significant discrepancies with the predictions of commonly used models for T_{ion} magnetotail.

About the Speaker: **Dr. Earl Scime is Chair of Physics and the Eberly Distinguished Professor at West Virginia University (WVU). He received the BS in Physics and Applied Math from Florida State Univ. and PhD in Plasma Physics from the Univ. of Wisconsin-Madison in 1992. He was then a Director's and Distinguished Postdoctoral Fellow at Los Alamos Natl. Lab. Dr. Scime joined WVU in 1995; helping to establish experimental and space plasma physics programs. His research has resulted in 110 journal publications. Current research includes ion heating in the solar corona, electric double layers, magnetosphere neutral atom imaging, laser-based measurements of velocity distribution functions, and plasmas processing of coal to produce syngas.**