AOGS 2006
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# ENA Imaging of Earth, Saturn, Titan and Mars

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Remote imaging of space plasma by detection of energetic neutral atoms(ENA) have now been in use for ten years. The High Energy Neutral Atom(HENA) imager on board IMAGE mission is imaging the Terrestrial ringcurrent and plasmasheet. The Ion Neutral Camera (INCA) on boardCassini is returning ENA images of Saturn's magnetosphere and itsinteraction with the moons. The Neutral Particle Imager (NPI) andDetector (NPD) on board Mars Express images the interaction betweenthe solar wind and the martian atmosphere. These missions areproviding unique global comparisons of the interactions betweenenergetic ions and neutral gas around magnetized (Earth, Saturn) andweakly magnetized (Mars, Titan) bodies. While the Earth's magnetosphere is largely a convection-dominatedsystem where plasma-neutral interactions take place at low altitudes, INCA showed a corotating saturnian magnetosphere where energetic ions(∼10-200 keV) interacting strongly with neutral gas confined to theequatorial plane with no apparent energetic ions reaching the upperatmosphere of Saturn. Both the terrestrial and saturnianmagnetospheres see frequent injections of energetic ions in thenightside region. At Earth these injections end up in the ring currentregion and magnetically drift around the Earth. At Saturn theinjections end up in a corotation region where the energetic ionsdrift in the corotation electric field with only modest dispersion dueto magnetic drifts. We discuss the relative importances ofcharge-exchange loss and transport of the energetic ions in the twosystems. Orbiting Saturn in about 16 (Earth) days at a distance of about 20R$_S$, Titan sees energetic ion clouds corotating over it with a speedof about 150 km/s. INCA images show how a large region around Titan"lights" up in ENAs every time a corotating plasma cloud sweeps pastit. The extension of the ENA emissions around Titan are consistentwith an H$_2$ exosphere extending to several 10, 000 km altitude aboveTitan. At lower altitudes strongly asymmetric and directional ENAemissions indicate a complex interaction that requires treatment ofthe magnetic field geometry and single-particle trajectories to beexplained. We will discuss and compare the plasma interactions atTitan and Mars based on recent findings by Cassini and the NPI and NPDimagers on board Mars Express.