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The Titan exosphere and its interaction with the kronian magnetosphere : INCA/LEMMS observations statistical analysis and modeling

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Titan's nitrogen-rich atmosphere is directly bombarded by energetic ions, due to its lack of a significant intrinsic magnetic field. Singly-charged energetic ions from Saturn's magnetosphere undergo charge exchange collisions with neutral atoms in Titan's exosphere, being transformed into energetic neutral atoms (ENAs). The Ion and Neutral Camera (INCA), one of the three sensors that comprise the Magnetosphere Imaging Instrument (MIMI) on the Cassini/Huygens mission to Saturn and Titan, images the ENA emissions from various ion/gas interaction regions in the Saturnian magnetosphere. The LEMMS instrument, also part of the MIMI experiment, gives in situ data for the energetic ions. The INCA data acquired during the Titan flybys revealed a complex interaction. A statistical analysis of both INCA and LEMMS data was performed, showing the main ENA features for the Titan environment by remote sensing, as well as the great variability of the energetic ion environment at the Titan orbit. These observations were analyzed and compared to simulations, allowing the evaluation of the various loss mechanisms for ENAs in the lower exosphere. Finally, a study of the non thermal profiles in the exosphere will be presented.