Geophysical Research Abstracts
Vol. 15, EGU2013-11455, 2013
EGU General Assembly 2013

Modeling the satellite particles in planetary exospheres: application to Earth, Titan and Mars.

Arnaud Beth (1,2), Philippe Garnier (1,2), Dominique Toublanc (1,2), Iannis Dandouras (1,2), Christian Mazelle (1,2), Anna Kotova (2,3)

(1) Université de Toulouse; UPS-OMP; IRAP; Toulouse, France, (2) CNRS; IRAP; 9 Av. colonel Roche, BP 44346, F-31028 Toulouse cedex 4, France, (3) Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany

The planetary exospheres are poorly known in their outer parts, since neutral densities are low compared with the instruments detection capabilities. Exospheric models are thus often the main source of information at such high altitudes. We revisit here the importance of a specific exospheric population, i.e. satellite particles, which is usually neglected in the models. These particles are indeed produced through rare collisions in the exospheres, and may either be negligible or dominate the exospheres of all planets with dense atmospheres in our solar system, depending on the balance between their sources and losses. Richter (1979) were the first to propose, beyond the Chamberlain's (Chamberlain (1987)) rough approximation, a rigorous approach for these particles by using the Boltzmann equation in the Earth exosphere between 500 km and 3000 km altitude. They pointed out their negligible presence at low altitudes without doing this calculation at higher altitudes. We attempt here to apply the same formalism for other planetary exospheres: Mars and Titan thanks to improvements in the computing power and the collected planetary data. In particular, we determine the contribution of satellite populations to the densities of light elements (molecular hydrogen on Titan, atomic hydrogen on Earth and Mars) and evaluate the possible error on the total density if the satellite particles are neglected. The satellite populations may represent up to 50 % of the ballistic and escaping populations (those considered in the collisionless models) in the case of H on Mars, suggesting that the collisionless models of exospheric densities may be inaccurate at high altitudes for some conditions.