EPSC Abstracts
Vol. 9, EPSC2014-755, 2014
European Planetary Science Congress 2014

Estimation of aggregation processes for dust in the Enceladus vents

A. Dzhanoev (1), J. Schmidt (2) and F. Spahn (1)
(1) University of Potsdam, Golm, Germany (janoev@yahoo.com), (2) University of Oulu, Finland

Abstract

We investigate the possibility of dust aggregation processes when icy grains are transported by water vapor streams in the subsurface vents of Saturn's active moon Enceladus to space. Dust aggregates, or non-spherical dust grains, generally establish up to ten times higher equilibrium charges than a spherical grain of the same mass when exposed to equivalent charging conditions. This indicates that dust charging models with spherical grains lead to a net charge underestimation. The effect might be important if one likes to verify if dust charging can account for the misfit between ion and electron densities inferred from data taken by the Cassini-Langmuir probe in the E ring and in the Enceladus plume [1]. Furthermore, an increased charge-to-mass ratio, and a reduced bulk density for dust in Saturn's inner magnetosphere will affect to some degree the dynamics of these grains in the E ring region. This will alter the size-dependent lifetimes of particles, which ultimately determine the steady state size- distribution of E ring grains.

References

[1] M. Shafiq, J. Wahlund, M. Morooka and K. William and W. Farrell, Characteristics of the dust–plasma interaction near Enceladus' South Pole, Planetary and Space Science, Vol. 59, pp. 17?25, 2011.

[2] J. Sterken, N. Altobelli, S. Kempf G. Schwehm, R. Srama and E. Grün, The flow of interstellar dust into the solar system, Astronomy and Astrophysics, Vol. 538, p. 102, 2012.

[3] J. Schmidt, N. Brilliantov, F. Spahn and S. Kempf, Slow dust in Enceladus' plume from condensation and wall collisions in tiger stripe fractures, Nature, Vol. 451, pp. 685-688, 2008.

[4] J. Schmidt, H. SALO, O. Petzschmann and F. Spahn, Vertical distribution of temperature and density in a planetary ring, Astronomy and Astrophysics, Vol.345, pp. 646?652, 1999