EPSC Abstracts
Vol. 12, EPSC2018-783, 2018
European Planetary Science Congress 2018

Implications of Rosetta data on cometary dust stream dynamics and their risk for interplanetary space crafts

Raphael Marschall (1), Laurent Jorda (2), S Kokou Dadzie (3), Paul Hartogh (4), Ekkehard Kührt (5), Rafael Rodrigo (1), Nicolas Thomas (6), Ian Wright (7)
(1) International Space Science Institute, Hallerstrasse 6, CH-3012 Bern, Switzerland, (2) Laboratoire d'Astrophysique de Marseille, UMR 7326, 13388 Marseille, France, (3) Heriot-Watt University, Institute of Mechanical Process and Energy Engineering, EH14 4AS Edinburgh, Scotland, (4) Max-Planck-Institut fur Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany, (5) DLR, Institut für Planetenforschung (DLR-PF), Rutherfordstraße 2, D-12489 Berlin, Germany, (6) Physikalisches Institut, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland, (7) Planetary and Space Sciences Research Institute, Open University, Walton Hall, Milton Keynes, MK7 6AA UK

Abstract

From August 2014 to September 2016 ESA's Rosetta spacecraft escorted comet 67P/Churyumov-Gerasimenko (hereafter 67P) on its journey into the inner solar system and out again. The mission provides, via various dust and gas instruments, unprecedented data on the nature of cometary activity.

By using state of the art models for the inner gas and dust comae dynamics for the interpretations of Rosetta data sets (e.g. [1], [2], and [3]) we are now able to extend our understanding of the dust emission direction and speed distribution of cometary dust particles. Furthermore the in-situ dust experiments provide data point to determine the dust size distribution (e.g. [4], and [5]). This expands our knowledge of the dust size distribution we have from other comets (e.g. [6] for 1P/Halley). These results are the basis to determine the trajectories of dust streams within the solar system (e.g. [7]). Such models can predict the number densities of interplanetary dust particles originating from comets. In this work we will present the effects of our updated input parameters which are informed by Rosetta measurements on the dynamics of these dust stream. Understanding the dynamics of dust streams is of great importance for our assessment of the risk for interplanetary space craft posed by cometary dust particles. The results of or model can be directly used to estimate this risk by calculating dust impact probabilities.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 686709 (MiARD project, www.miard.eu). This work was supported by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 16.0008-2. The opinions expressed and arguments employed herein do not necessarily reflect the official view of the Swiss Government.

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