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Aspherical dust dynamics code for GIADA experiment in the coma of 67P/Churyumov-Gerasimenko

Stavro Ivanovski (1,2), Vladimir Zakharov (3,4), Vincenzo Della Corte (1), Francesca Lucarelli (5), Jean-Francois Crifo (6), Alessandra Rotundi (5), and Marco Fulle (7)

(1) INAF- Istituto di Astrofisica e Planetologia Spaziali (IAPS), Roma, 00133, Italy, (2) Osservatorio Astronomico di Capodimonte, Naples, Naples, Italy (stavro@na.astro.it, +39 081 5575433), (3) LESIA, Observatoire de Paris, F-92195, Meudon, France,, (4) Gordien Strato S. A. R. L., Verrieres le Buisson, 91370, France,, (5) Università degli Studi di Napoli "Parthenope" – Dip. Scienze Applicate Centro Direzionale Isola C4, 80143, Napoli, Italy, , (6) LATMOS, CNRS, Guyancourt, 78280, France, (7) INAF-Osservatorio Astronomico di Trieste, Trieste, 34143, Italy

In 2014, the ESA ROSETTA probe is on its way to face its main scientific objectives by encountering and landing on comet 67P/Churyumov- Gerasimenko. One of the in-situ instrument on board ROSETTA
is GIADA (Grain Impact Analyzer and Dust Accumulator)[1], which will measure individual dust grain mass, number density and velocity in the immediate vicinity of the cometary nucleus. Based on the state-of-the-art 3D+t dust coma model [3,4] we developed a 3D+t aspherical dust dynamical code Giaspheria (GIADA aspherical dust analyzer) which treats aspherical dust motion to support the scientific objectives of GIADA. We report the latest improvements in Giaspheria[5,6,7] and the distinctions in the dust dynamics of spherical and aspherical grains using gas solutions for a spherical nucleus not yet data-calibrated.
We consider motion of homogeneous, isothermal polygonal convex bodies (close to ellipsoid of revolution with different aspect ratios of axes), moving under influence of three forces: aerodynamic , gravitational and torque. We use the gas distribution (density, velocity, temperature) for a spherical nucleus discussed in [4,8]. We estimate the aerodynamic force from expressions for free molecular interactions and postulate the distribution function of ejection velocity and the distribution function of initial orientation on the surface of the nucleus.
We show the dust distribution of aspherical grains at three different heliocentric distances (3AU, 2AU and 1.3 AU) by means of GIPSI simulated GIADA measurements during these stages of the mission. As an input for GIPSI simulations we use the dust and velocity distributions previsied by Giaspheria computations.

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