Geophysical Research Abstracts
Vol. 17, EGU2015-13156-3, 2015
EGU General Assembly 2015

GIADA on-board Rosetta: comet 67P/C-G dust coma characterization

Alessandra Rotundi (1,2), Vincenzo Della Corte (2), Marco Fulle (3), Roberto Sordini (2), Stavro Ivanovski (2), Mario Accolla (1,2), Marco Ferrari (1,2), Francesca Lucarelli (1), Vladimir Zakharov (4), Elena Mazzotta Epifani (5), José J. López-Moreno (6), Julio Rodríguez (6), Luigi Colangeli (7), Pasquale Palumbo (1,2), Ezio Bussoletti (1), Jean-Francois Crifo (8), Francesca Esposito (5), Simon F. Green (9), Eberhard Grün (10), Philippe L. Lamy (11), and the J. Tony M. McDonnell (9,12), Vito Mennella (5), Antonio Molina (13), Rafael Morales (6), Fernando Moreno (6), Josè L. Ortiz (6), Ernesto Palomba (2), Jean-Marie Perrin (8,14), Rafael Rodrigo (15,16), Paul Weissman (17), John C. Zarnecki (16), Massimo Cosi (18), Frank Giovane (19), Bo Gustafson (20), Miguel L. Herranz (6), Josè. M. Jerónimo (6), Mark R. Leese (9), Antonio C. López-Jiménez (6), Nicolas Altobelli (21) Team

(1) Università degli Studi di Napoli, Napoli, Italy (alessandra.rotundi@uniparthenope.it), (2) INAF – Istituto di Astrofisica e Planetologia Spaziali, Via Fosso del Cavaliere, 100, 0133, Rome, Italy., (3) INAF – Osservatorio Astronomico di Trieste, Via Tiepolo Giambattista, 11, 34131 Trieste, Italy., (4) LESIA, Obs. de Paris, CNRS, Univ Paris 06, Univ. Paris-Diderot, 5 place J. Janssen, 92195, Meudon, France, (5) INAF – Osservatorio Astronomico di Capodimonte, Salita Moiariello, 16, 80133, Naples, Italy., (6) Instituto de Astrofísica de Andalucía (CSIC), Glorieta de la Astronomía s/n, 18008 Granada, Spain., (7) ESA - ESTEC, Keplerlaan 1, 2201 AZ Noordwijk, The Netherlands. , (8) LATMOS, 11 Bd d'Alembert, F78280 Guyancourt, France., (9) Planetary and Space Sciences, Department of Physical Sciences, The Open University, Milton Keynes, MK7 6AA, UK., (10) Max-Planck-Institut fuer Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany, (11) Astrophysics Laboratory of Marseilles, UMR7326 - CNRS-INSU, Université d'Aix-Marseille, Marseilles, France, (12) The University of Kent, Canterbury, Kent, CT2 7NZ, UK, (13) Departamento de Física Aplicada, Universidad de Granada, Facultad de Ciencias, Avda. Severo Ochoa, s/n, 18071, Granada, Spain., (14) Observatoire de Haute Provence OSU Pythéas UMS 2244 CNRS-AMU, 04870 Saint Michel l'Observatoire, France, (15) Centro de Astrobiologia (INTA-CSIC), 28691 Villanueva de la Canada, Madrid, Spain, (16) International Space Science Institute, Hallerstrasse 6, 3012, Bern, Switzerland, (17) Planetary Science Section, Jet Propulsion Laboratory, 4800 Oak Grove Dr, Pasadena, CA 91109, USA, (18) Selex-ES, Via A. Einstein, 35, 50013 - Campi Bisenzio – (Firenze), Italy, (19) Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA , (20) University of Florida, Gainesville, Florida, 32611, USA

21ESA-ESAC, Camino Bajo del Castillo, s/n., Urb. Villafranca del Castillo, 28692 Villanueva de la Cañada, Madrid, Spagna

GIADA consists of three subsystems: 1) the Grain Detection System (GDS) to detect dust grains as they pass through a laser curtain, 2) the Impact Sensor (IS) to measure grain momentum derived from the impact on a plate connected to five piezoelectric sensors, and 3) the MicroBalances System (MBS); five quartz crystal microbalances in roughly orthogonal directions providing the cumulative dust flux of grains smaller than 10 microns. GDS provides data on grain speed and its optical cross section. The IS grain momentum measurement, when combined with the GDS detection time, provides a direct measurement of grain speed and mass. These combined measurements characterize single grain dust dynamics in the coma of 67P/CG. No prior in situ dust dynamical measurements at these close distances from the nucleus and starting from such high heliocentric distances are available up to date. We present here the results obtained by GIADA, which began operating in continuous mode on 18 July 2014 when the comet was at a heliocentric distance of 3.7 AU. The first grain detection occurred when the spacecraft was 814 km from the nucleus on 1 August 2014. From August the 1st up to December the 11th, GIADA detected more than 800 grains, for which the 3D spatial distribution was determined. About 700 out of 800 are GDS only detections: "dust clouds", i.e. slow dust grains ($\approx$ 0.5 m/s) crossing the laser curtain very close in time (e.g. 129 grains in 11 s), probably fluffy grains. IS only detections are about 70, i.e. $\approx$ 1/10 of the GDS only. This ratio is quite different from what we got for the early detections (August – September) when the ration was $\approx$ 3, suggesting the presence of different types of particle (bigger, brighter, less dense).The combined GDS+IS detections, i.e. measured by both the GDS and IS detectors, are about 70 and allowed us to extract the complete set of dust grain parameters, i.e. mass, speed, and geometrical cross-section. These detections allowed us to constraint the grain density. The GIADA detections type was studied as a function of the observational geometrical configuration.

Acknowledgments: GIADA was built by a consortium led by the Univ. Napoli “Parthenope” & INAF- Oss. Astr. Capodimonte, in collaboration with the Inst. de Astrofisica de Andalucia, Selex-ES, FI and SENER. GIADA is presently managed & operated by Ist. di Astrofisica e Planetologia Spaziali-INAF, IT. GIADA was funded and managed by the Agenzia Spaziale Italiana, IT, with the support of the Spanish Ministry of Education and Science MEC, ES. GIADA was developed from a PI proposal from the University of Kent; sci. & tech. contribution were provided by CISAS, IT, Lab. d’Astr. Spat., FR, and Institutions from UK, IT, FR, DE and USA. We thank the RSGS/ESAC, RMOC/ESOC & Rosetta Project/ESTEC for their outstanding work. Science support provided was by NASA through the US Rosetta Project managed by the Jet Propulsion Laboratory/California Institute of Technology. GIADA calibrated data will be available through ESA’s PSA web site (www.rssd.esa.int/index.php?project=PSA&page=in dex). We would like to thank Angioletta Coradini for her contribution as a GIADA Co-I.