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Improvements in the calibration of GIADA's measurement subsystems

R. Sordini[1], V. Della Corte[1], A. Rotundi[1,2], M. Accolla[1,2], M. Ferrari[1,2], S. Ivanovski[1], F. Lucarelli[2], E. Mazzotta Epifani[3], and P. Palumbo[1,2]

[1] INAF-IAPS, Istituto di Astrofisica e Planetologia Spaziali, Area di Ricerca di Tor Vergata, via Fosso del Cavaliere 100, 00133 Roma, Italy
[2] Università degli Studi di Napoli "Parthenope", Dipartimento di Scienze e Tecnologie, Centro Direzionale Isola C4, 80143 Napoli, Italy
[3] INAF Osservatorio Astronomico di Roma, Via Frascati 33, 00078, Monte Porzio Catone, Roma, Italy

Abstract.

The Grain Impact Analyzer and Dust Accumulator (GIADA) is an in-situ instrument devoted to measure the dynamical properties of the dust grains emitted by the comet. Using the GIADA Proto Flight Model (PFM), installed in a clean room in our laboratory, an extended calibration activity (Sordini et al. 2014) has been carried out taking into account the knowledge gained through the analyses of IDPs and cometary samples returned from comet 81P/Wild 2 (Brownlee et al. 2006; Rotundi et al. 2014). GIADA consists of three measurement subsystems: the Grain Detection System, an optical device measuring the optical cross-section of single grain without affecting its dynamical properties; the Impact Sensor that measures the momentum released from each grain that impacts its sensitive surface, and the Micro Balance System, a network of five Quartz Micro Balances measuring the cumulative dust deposition from different space directions (Della Corte et al. 2014). The results of the analyses on data acquired with the GIADA PFM and the comparison with calibration data acquired during the pre-launch campaign allowed us to improve GIADA performances and capabilities. We report the results of the following main activities:

1. definition of a correlation between the two GIADA Models, i.e. PFM and In-Flight Model on-board Rosetta;
2. characterization of the sub-systems performances (signal elaboration, sensitivities, space environment effects);
3. new calibration measurements and related curves by means of the GIADA PFM using realistic cometary dust analogues (Ferrari et al. 2014).

All the analyses performed during this extended calibration activity are allowing to fully characterize the dynamic parameters of the dust particles ejected by the comet 67P/Churyumov-Gerasimenko (Rotundi et al. 2015; Fulle et al. 2015; Della Corte et al. 2015).

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