GIADA performances simulation: reconstruction of comet 67P/Churyumov-Gerasimenko dust environment at 3 AU.

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The short-period comet 67P/Churyumov-Gerasimenko (hereafter 67P/C-G) is the target of the ESA Rosetta space vehicle launched in 2004. After almost a decade of flight, Rosetta spacecraft will reach the comet and will explore the coma environment and the nucleus surface releasing a Lander on it. Cometary coma models together with performances evaluations of payloads able to monitor the cometary dust activity (e.g. GIADA) play a key role in the prediction of the environment that Rosetta will encounter.

We simulated GIADA performances with different: 1) Space/Craft (S/C) trajectory; 2) pointing profile; 3) mission phase. Our aim was to evaluate the optimal GIADA scenario in terms of scientific return. Coupling dust coma modelling with GIADA performances simulations supports the evaluation of S/C orbits during the Rosetta scientific phase with respect to the scientific data collectable. In addition, it contributes to forecast the dust environment during the pre- and landing phase. Finally, this work can predict payloads components (e.g. optics) performance degradation due to dust deposition for certain orbits scenarios.

To simulate the GIADA instrument performances at 3 AU we used the GIPSI tool (GIADA Performance SImulator). GIPSI simulates the instrument performances in terms of scientific (number of detected grains) and technical (data volume) response having as in-puts: 1) the output of 3D evolutionary coma model and 2) the orbit proposed by the ESA/Rosetta Scientific Ground Segment;

GIPSI simulations provide the number of collected grains per hour, their cumulative values and information on their velocities.