Simulation of dusty plasma environments : application cases to 65803 Didymos for the Asteroid Impact Mission (AIM) and Rosetta electrostatic sheath interaction with cometary grains

Fabrice Cipriani[1], Andreas Waets[1], Nicolas Altobelli[3], Matt Taylor[1], Alain Hilgers[1], David Rodgers[1], Ian Carnelli[2]

1. ESTEC, Noordwijk, The Netherlands.
2. ESA/HQ, Paris, France.
3. ESAC, Villafranca del Castillo, Spain

We present some ongoing work related to space dusty plasma environments modelling:

1/ In the context of the Asteroid Impact and Deflection Assessment mission (AIDA), a technology demonstrator mission including the DART asteroid impactor (NASA/JHU/APL) and the AIM asteroid rendezvous platform (ESA/DLR/OCA), we have developed a model describing the plasma (including charged dust) components of the near surface environment of the Near Earth binary Object 65803 Didymos moonlet, targeted by the MASCOT-2 lander. Based on our best knowledge of regolith properties and simplifying assumptions, charging levels, density profiles, and velocity distribution of regolith grains separated from the surface and populating the environment up to about 70m above the surface have been calculated.
2/ In the context of the ESA/Rosetta mission, the interpretation of a number of datasets (e.g. GIADA, COSIMA) related to cometary grains properties, rely on the description of cometary grains dynamic from the far field to the close vicinity of the spacecraft. In particular the charged grains behaviour in the spacecraft sheath open to the instrument entrances is not well constrained. In an attempt to better understand this behaviour we present some preliminary results on the modelling of charged grains dynamic within a simplified Rosetta sheath structure resulting from the s/c interaction with the cometary plasma.