Geophysical Research Abstracts
Vol. 21, EGU2019-18813, 2019
EGU General Assembly 2019

Assessment on small bodies impacts and fragments plume dynamics modelling through SPH with LS-DYNA solver

Giovanni Zanotti, Michèle Lavagna, and Capannolo Capannolo
Politecnico di Milano, Aerospace Science & Technology Dept., Milano (michelle.lavagna@polimi.it)

The capability to correctly model and simulate collisions occurring in space is becoming a key asset to support either scientific investigations or space exploration probes sizing whenever natural\artificial or natural\natural objects contact is a core event in the investigated low gravity field regime scenario.
In particular, Politecnico di Milano, Aerospace Engineering Department, started some time ago, implementing a validated simulator to model on orbit multiple fragments aggregations - under gravitational attraction - to better model the generated irregular multi-particle gravity field functional to design a refined mission analysis for small bodies robotic exploration. The tool started recently being extended to multi-particles dynamics modelling risen from after collision fragmentation. The tool si supposed to support science and technology development for scenarios which include: impacts between natural bodies to understand post event fragments dynamics evolution, crater formation, material properties; contacts between artificial\natural bodies at limited velocity, to capture surface regolith dynamics and deposition after the contact, depending on interacting materials, morphology, relative velocity. To this end, a SPH approach has been preferred, in line with recent literature and the LS-DYNA solver is exploited as numerical solver.
The paper critically presents the results obtained so far during the tool verification and validation campaign with respect to the recent literature, and the discusses results obtained from simulation of some preliminary natural and artificial impact testing scenarios, including the DART mission impact case, with particular attention to the plume generation and evolution modelling.