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Author: Mr. Fawzan Mohamed Kareem Navaz
Amity University, Dubai, United Arab Emirates

Mr. Ayush Harish Kumar
Amity University, Dubai, United Arab Emirates
Dr. Sarath Raj Nadarajan Syamala
Amity University, Dubai, United Arab Emirates

NUMERICAL MODELING OF HYPERVELOCITY IMPACT CRATERS ON LUNAR AND MARTIAN SURFACES

Abstract

Impact craters on the Moon and Mars provide valuable insights into the history of the solar system and are critical for planning future missions. This research investigates hypervelocity impacts, where asteroids and comets collide with planets at extreme speeds. Using ANSYS LS-DYNA, the study simulates these impacts, capturing shockwave propagation, debris ejection, and ground deformation under immense pressure. These simulations reveal how crater morphology, material distribution, and ejecta trajectories vary with gravity and surface composition. This information is crucial for selecting safe landing sites, identifying potential resources, and developing planetary defense strategies. Understanding these impact dynamics helps protect Earth from similar events and provides insights into the formation of the solar system.