41st STUDENT CONFERENCE (E2)
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Author: Ms. Audrey GROCKOWIAK
Institut Néel, CNRS and Université Joseph Fourier and : CEA-Grenoble, Institut Nanosciences et Cryogénie, SPSMS-LATEQS, France

Mr. Rémi de Guiran
CNRS, France
Ms. Magali Dugué
CNRS, France
Ms. Laurianne Palin
Institut de Recherche en Astrophysique et Planétologie (IRAP), France
Mr. Jérôme Giraud
CNRS-UJF, France
Mr. Julien Vandeportal
Centre de recherche en astrophysique du Québec(CRAQ), Canada
Dr. Thomas Podgorski
Laboratoire Interdisciplinaire de Physique, CNRS and Université Joseph Fourier, France
Dr. Jean-Charles Augereau
Institut de Planétologie et d'Astrophysique de Grenoble, CNRS and Université Joseph Fourier, France

OBSERVING COLLISIONS OF SIMULATED ASTEROIDS IN MICROGRAVITY

Abstract

We report on the < Deep Impact ! > experiment that will be performed in microgravity during the 54th ESA parabolic flight campaign (14-25 March 2011). Deep Impact ! is a student experiment selected by the ESA Education program Fly Your Thesis ! in 2010.

Our <Deep Impact> experiment is related to the modeling and understanding of dust production due to asteroid collisions in late debris discs, in order to improve theoretical and numerical models that relate the dust observed around stars to the existence of large bodies like exoplanets which are difficult to observe directly. For example, the origin to the discovery of Fomalhaut exoplanet system as well as Beta Pictoris' are based on the observation of its debris disk.

The aim of our experiment is thus to study the dust resulting from the collision between a projectile and a target simulating an asteroid. The projectile is a 6mm aluminum bead, and the target is a 2cm sphere of compacted dust and particles. The dusts used are peridotite, JSC MARS 1-A and LUNAR 1-A analogs, with a grain size distribution ranging between 50 and 500 microns. The projectile and the target are collided under vacuum and in microgravity using an original experimental set up we will describe. The collision energy is probed by varying the projectile velocity between 1 and 10m/s.

The experimental data we focus on are the production rate, the size distribution and the velocity field of the dust produced by the impact, as well as the Q* parameter, ie the energy required for the fragmentation of targets. Those data are obtained by filming the collisions with two high frequency cameras (2000fps) I-SPEED 3 by Olympus, and by doing particle-tracking analysis. This will enable to refine current statistical simulations of collisions that do not take into account the asteroids composition, the velocity field and the impact parameter in cratering processes.