# Numerical and Laboratory Explorations of the Response of Small Bodies to Various Kinds of Stresses (Impacts, Rotation, Vibrations)

PATRICK MICHEL

*University of Nice-Sophia Antipolis, CNRS, Côte d'Azur Observatory*
*UMR 6202 Cassiopée, BP 4229, 06304 Nice Cedex 4, France*
*Tel: +33-492-003-055, Email: michelp@oca.eu*

During their evolutions, small bodies of our Solar System are subjected to various kinds of stresses. Their response of small bodies to those stresses is still not well understood and depends on their physical properties. As a result, those properties can also be modified.

In recent years, numerical simulations of the collisional process have been performed, allowing the characterization of the outcome of the disruption of asteroids in different impact energy regimes. Numerical models of fragmentation of both non-porous and porous bodies have been developed and validated at small scales by successful confrontation with laboratory experiments (e.g. [1]). Their application at large scale was done by accounting for the gravitational phase of the process during which the generated fragments interact under their mutual gravitational attractions. It was then found that during a large-scale disruption gravitational re-accumulations take place, resulting in a size distribution of fragments consisting of gravitational aggregates. This allowed reproducing successfully the properties of some major bright spectral type asteroid families, supposed to originate from non-porous parent bodies in the main belt (e.g., [2]). Application to dark type families, supposed to originate from porous parent bodies, have just started.

Numerical simulations of the spin-up of a small body, as a result of the YORP thermal effect, have then been performed and provided an explanation to the origin of small binaries in both the Near-Earth and Main Belt asteroid populations ([3]).

Numerical and experimental studies of the behavior of granular surfaces (e.g. regolith) of small bodies under different conditions have also started. The dynamics of granular surfaces on small bodies may explain some properties such as the lack of small craters observed both on Eros and Itokawa.

A review of these researches and future perspectives will be presented.

Keywords: Impacts; Fragmentation; Asteroids; Granular Materials.

## References

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