

## N-body simulations of Rubble pile Collisions in Tidal fields

HYODO, Ryuki<sup>1\*</sup> ; OHTSUKI, Keiji<sup>1</sup>

<sup>1</sup>Kobe University, Graduate School of Science

We examine collisional disruption of gravitational aggregates in the tidal environment by using local N-body simulations. We find that outcomes of such collision largely depend on impact velocity, direction of impact, and radial distance from the planet. In the case of a strong tidal field corresponding to Saturn's F ring, collisions in the azimuthal direction is much more destructive than those in the radial direction. Numerical results of collisions sensitively depend on impact velocity, and complete disruption of aggregates can occur even in impacts with velocity much lower than their escape velocity. In such low-velocity collisions, deformation of colliding aggregates plays an essential role in determining collision outcomes, because the physical size of the aggregate is comparable to its Hill radius. On the other hand, the dependence of collision outcomes on impact velocity becomes similar to the case in free space when the distance from the planet is sufficiently large. We submitted the results to the *Astrophysical Journal*.

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