Numerical Simulations of Impact and Cratering with Density Independent Smoothed Particle Hydrodynamics

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Impacts of meteorite are important phenomenon for the planetary geology. Since these processes cannot be experimented
in laboratories, numerical hydrodynamical simulations of the impact process play important role. For these processes,
particle based numerical hydrodynamical simulations have several advantages over grid-based methods, because these
processes often involve large deformation of target and oblique impacts.
The Smoothed Particle Hydrodynamics (SPH) is a widely used particle based numerical hydrodynamical scheme.
It is first developed in astrophysical field. Recently, it was adopted to the impact cratering. However,
it has been pointed out that the standard SPH formulation has difficulties in the treatment of contact
discontinuity; an unphysical repulsive force acts between two different materials, such as rock and water.
Thus, we have developed new particle based hydrodynamical, Density Independent SPH (DISPH), which overcomes
this difficulty.
We have developed a new massively parallel particle based numerical hydrodynamical simulations code by means of
DISPH. We adapted Framework for Developing Particle Simulator (FDPS), which enables us to perform high-performance
parallel particle simulations easily. We will show the results of impacts of the tuff to the water with both DISPH
and SSPH.

Keywords: numerical simulations of impact

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