Vortex, vortex, vortex in impacting on a particle layer

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We are interested in the formation process of Martian craters. Most of the experimental approaches on the formation process of craters are based on the high-speed impact experiments. Since we are interested in the late stage of the cratering phenomena, particularly emplacement process of the ejecta, we have conducted analogous experiments using water and small particles. The purpose of our research is to evaluate the effect of atmosphere on the formation process of ejecta of Martian craters.

The experiments were carried out in a transparent rectangular tank filled with water, and small particles were paved at the bottom of the tank. The tank was illuminated in a vertical plane and fine tracers were put in water. We generated a vortex ring moving a piston through a cylinder and make it impact on the particle layer. We observed the interaction between the vortex ring and the particles using high-speeded digital video camera.

Recent advance in microelectronics have produced compact and easy-to-use high-speed digital video cameras at reasonable price. The video images shown here are taken at 1000fps with the spatial resolution of 1024pix. High sensitivity of the camera head and its speed enables the analysis based on the PIV technique, which greatly improved our understanding of the development of vortex structures.

We will show the vivid movies showing the interaction between the vortex ring and the particle layer.