Analyses on morphology of central pit craters and distribution of secondary craters on Mars

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We report the results of analyses on the Martian impact craters and will discuss on whether or not we can derive any information of the Martian surface property or its environment from these analyses. The first topic is the morphology of central pit craters and the second is the spatial distribution of the secondary craters of km-size primary craters.

In Martian complex craters, there are craters having interior features such as floor pits and summit pits. While the craters having a floor pit exist ubiquitous on icy satellites, they are uniquely conspicuous on Mars and rare on the other terrestrial planets. The presence of pits has been attributed to the interaction of the crater-forming process with a volatile component. However, the detailed process of the pit formation has not been understood yet, nor the detailed morphology of the pit craters. The data of the Mars Orbiter Laser Altimeter (MOLA) on board the Mars Global Surveyor (MGS) have enabled us to measure the vertical dimensions of the craters. In order to get more information on the Martian pit craters, we derived the three-dimensional morphology of them from the MOLA data and will discuss on a comparison with those of icy satellites.

Ejecta size-velocity relation may be dependent on the material property of the target body. Melosh (1984) proposed a model that the ejection velocity of spalls is proportional to the strength of the target body and in inverse proportion of the density and the sound velocity.

Vickery (1987) studied the ejecta size-velocity distribution by analyzing the size of secondary craters and the distance between the secondaries and the primary craters. The diameter of the primary craters was from a few tens to a hundred km. We studied, for the first time, the distribution of the secondary craters of smaller, km-size primary craters using the images of the Mars Orbiter Camera (MOC), and filled the data of ejecta having velocity of a hundred m/s into the gap of the previous results of the Vickery's and laboratory works. Our data fit in the tendency shown by the previous works. We will discuss on a comparison between the results of the Martian craters and the craters on the Moon.