

Estimation of the velocity of ejecta forming outer lobe

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Certain Martian impact craters, called rampart craters, have a unique ejecta blanket morphology. The most fundamental construct common to rampart craters consists of thicker inner lobe and thin outer lobe. Although there are many curious features on their ejecta blanket, we focused on a great number of grooves on the surface of the inner lobe observed for medium sized craters (10-20 km diameter). The grooves appear to radiate out from the center of the rampart craters. These grooves are considered as scars of scratches by rolling solid blocks in the ejecta forming the outer lobe. In several cases, the track of each groove exhibit a discontinuous gap when it crosses the cliff of the inner lobe. This indicates the ejecta forming the outer lobe have not small velocity. Here we report our estimates of this velocity based on the image analysis.

Many statistical study and laboratory experiments have been conducted to understand the mechanism of formation of rampart craters, and suggested that ejecta fluidization might deeply contribute to the formation of ejecta morphology of rampart craters. However, the mechanism of the ejecta fluidization has not been clarified well.

We investigated length of these gaps and estimated the velocity of flow of ejecta material, using the data obtained by the Mars Orbiter Camera (MOC) and Mars Orbiter Laser Altimeter (MOLA), both attached to the Mars Global Surveyor (MGS). Flow velocity of the outer lobe of rampart crater is estimated as 15-30 m/sec.