

Formation and modification of Type-A rampart crater in the northern lowland, Mars

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The morphology of rampart craters on Mars exhibits wide variations and is expected to give clues for the existence of subsurface volatiles. Recently we have been extensively engaged in constructing morphometric database of rampart craters. Ogawa and Kurita(2003) proposed existence of two types of crater having contrasting nature in the northern lowland. They are named as Type-A:explosive pedestal type and Type-B:normal rampart type. Their distributions are clearly separated and the boundary is characterized by the altitude of -4500m. Type-A has several peculiar morphometric characteristics which have not been well documented and understood. Here we focus on this type and consider its formation and modification process.

Type-A rampart craters in the northern lowland are exclusively located at the altitude below -4500m(Ogawa and Kurita). They were mostly classified as pedestal type but recent high resolution images have revealed that they are accompanied by very thin ejecta extending beyond the pedestal region. We consider they are also a class of rampart crater. The most distinct difference in the morphology of Type-A from the ordinary rampart craters is the floor depth. In the diagram of floor depth vs. cavity diameter, maximum value at corresponding cavity diameter is similar between type-A and Type-B(ordinary rampart) but Type-A has wide variation to shallower depth. This indicates the cavity was filled by something, which is probably ice (Garvin et al,2000). Associated with this another distinct nature is existence of negative slope of the surface of the inner lobe(pedestal part) towards the cavity. In several cases remarkable depression exists just outside the crater rim. These topography can be interpreted as a depression caused by addition of mass in the cavity after the formation of crater. We also propose the crater morphology is probably modified by intensive action of large scale frost-heaving process.