

Impact Processes of Blocks on Itokawa Surface

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Blocks on the surface of asteroid 25143 Itokawa observed in images taken by Asteroid Multi-band CAmera (AMICA) on board the HAYABUSA spacecraft provides us unique and valuable opportunity to observe the results of natural impact processes of very small bodies (blocks). In this paper, we briefly report the characteristics of the blocks of Itokawa from statistical and morphological point of views, then possible evidences of impact processes of blocks on the surface.

Any positive features are termed blocks here, which include the ones on the surface and the others partially buried. Crack, fracture, and scratch are found on some of the blocks, whose origin will be discussed later. Shapes of the blocks are rich in variety: some are thin, spall fragment-like and the others are square-shaped.

The number of blocks increases with decreasing block size. The power law index of the cumulative number of blocks larger than meter-scale varies at different faces of the surface within -2 and -3. This range of power law index is shallower than those found for the blocks larger than 15 m on Eros. On the other hand, cumulative number of ejecta from laboratory cratering and impact disruption experiments generally has an index of about -2. A simple interpretation of the shallower slope is less comminution processing of the blocks on Itokawa.

However, the blocks on Itokawa have evidences of past impact processes as mentioned above. The impact processes of the blocks on the surface are mainly (1) high velocity impact of solid mass and particles from the interplanetary space on the blocks and (2) low velocity impact of their own to the Itokawa surface. We will compile the data that have possible signature of the impact processes (erosion, disruption, and ejection) of the blocks, classify them, and derive any constraints on e.g., the impact flux of solid mass and particles from the interplanetary space, the mechanical properties of Itokawa, and so on.