**THE SHAPES OF FRAGMENTS WITH SIZES FROM SEVERAL TENS MICROMETERS TO SEVERAL CENTIMETERS IN CATASTROPHIC IMPACT EXPERIMENTS.**

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**Abstract:** Laboratory impact experiments have found that the shapes of impact fragments as defined by axes *a*, *b* and *c*, these being the maximum dimensions of the fragment in three mutually orthogonal planes ($a \geq b \geq c$) are distributed around mean values of the axial ratios *b/a* ~0.7 and *c/a* ~0.5, i.e., corresponding to *a* : *b*: *c* in the simple proportion 2: √2: 1. The shape distributions of some boulders on asteroid Eros, the small- and fast-rotating asteroids (diameter < 200 m and rotation period < 1 h), and asteroids in young families, are similar to those of laboratory fragments in catastrophic disruption. However, in laboratory impact experiments, only the shapes of fragments with sizes larger than several mm were investigated. In previous studies, there have only been very few laboratory impact experiment to investigate the shapes of fragments with sizes less than 1 mm. In order to investigate the shapes of fragments with sizes from several tens μm to several cm, catastrophic impact experiments for basalt cubic targets with 5 cm and 7.5 cm were performed. Impact experiments were carried out by firing a spherical nylon projectile (diameter 7.14 mm) perpendicularly into the target surface at a velocity of 5.3 km/s. The results show that, the mean values of *b/a* and *c/a* in small fragments with sizes from 40 to 400 μm are similar to those in relatively large fragments with sizes from 4 mm to several cm, although *c/a* values in small fragments appear to be slightly greater than those in large fragments. The mean values in these fragments are also similar to those found for Itokawa particles acquired by Hayabusa spacecraft as indicated in Tsuchiyama et al. [2011. Science 333, 1125-1128].