# Pole and Shape of (25143)Itokawa

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Asteroidal pole and its global shape are fundamental properties for rendezvous operation, mapping remote sensing data, and investigating the origin and evolution of the asteroid. A task team for shape modeling group submitted the information during and after Hayabusa's rendezvous with (25143)Itokawa on the basis of tracking GCPs (Ground Control Points) and image-based modeling. We're a joint task team of a part of AMICA (Asteroid Multiband Imaging Camera) science team and GNC (Guidance and Navigation Control) team.

The telescopic camera AMICA brought about 1400 images, 1GB. We've showed two versions for pole orientation. One is an interim version for beginning rendezvous operation (GNC interim version), and another is that for its late phase (Aizu version). Both values show good concordance; GNC interim version is J2000EQ (90.64, -66.17), J2000EC (123.5, -89.53), and Aizu one is J2000EQ (90.53, -66.30), J2000EC (128.5, -89.66). Although their ecliptic longitudes show large difference, delta-arc shows only a few degrees because of the polar neighborhood. This Itokawa shows retrograde rotation and its axis is almost perpendicular to the ecliptic plane. They are nearer to the ecliptic pole than previous values based on ground observations in Proceedings of the Hayabusa Symposium. Ostro et al. (2004) shows 2000EQ (92.3292245, -66.2011779) and 2000EC (160, -89), Kaasalainen et al. (2004) shows 2000EQ(87.7789980, -67.0452880) and 2000EC (330, -89).

Global shape of Itokawa is solved by stereogrammetric procedures with epipolar constraints from multi-viewpoints. Because spacing of control points depends on surface texture, 3D points of Itokawa show spacing from a few meters to several meters (the original images show about 75cm/pixel). The points are resampled and converted to a polygon model, whose actual resolution is 3 degree in spherical coordinates. Because this Itokawa shows a peanut-like constriction, some blind surfaces of the polygon model are corrected with polar images. Shape

properties of the polygon model are as follows; Surface Area is 0.393 squared kilometers, Volume is 1.8378E-2 cubic kilometers, Axes are X=0.535 Y=0.294 Z=0.209 (km), and Size of bounding box is 0.550 x 0.298 x 0.244 (km). Estimated margin of error for the volume is plus or minus about five percentages. The body-fixed coordinates and the north direction (+Z) follow the right-hand rule. Itokawa seems to be composed of two parts; the right small Head and the left large Body. They are separated by the constriction, which is called as Neck. This feature implies collided asteroids or a contacted binary system. The prime meridian passes through a GCP the Black Boulder on the head, and this gives +X direction with the longest diameter. Then the rest Y-axis is fixed. The head and the tail of the body show many facets and their majority would be impact origin. Map projection of spherical coordinates is also demonstrated as a geographical map.