

# What Itokawa Tells Us: Geology of a Sub-km, S-type Asteroid Investigated by Hayabusa.

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In September to November 2005, JAXA/ISAS' Hayabusa spacecraft successfully investigated global characteristics of a sub-km, S(IV)-type near-Earth asteroid (25143) Itokawa and it also attempted the first sampling of asteroid surface materials in history.

Initial results of these measurements [1, 2] revealed that the asteroid exhibits a clear dichotomy (see Figure) between rough terrains with full of large boulders and smooth terrains covered with size-sorted, cm-order gravel in the lowest potential regions [3]. Samples to be returned to the earth were collected from the smooth terrain called "Muses Sea". These features might be due to relatively recent geological activities (e.g., seismic shaking) generated by external energy sources such as meteoroid impacts and planetary perturbation. This opens a new research area of "microgravity geology", which is crucial to better-understand connection between geochemical results of meteoritic analyses and geological features measured by spacecraft, especially for primitive, undifferentiated objects.

Also evident are co-existence of high and low albedo components next to each other, implying differences in degrees of space weathering and particle size distribution. Otherwise, near IR and fluorescence X-ray spectrometry of Itokawa's surface are consistent with mineralogy and major compositions of ordinary chondrite meteorites [4, 5].

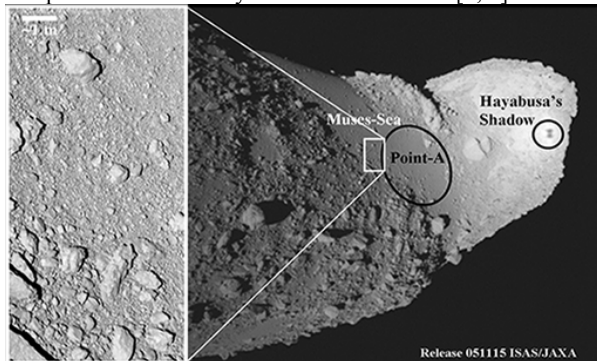


Figure: Image of the boundary between the rough terrain and the smooth terrain on Itokawa (courtesy: ISAS/JAXA)

- [1] Fujiwara A., *et al.* (2006) *Science*, **312**, 1330-1334.
- [2] Saito J., *et al.* (2006) *Science*, **312**, 1341-1344.
- [3] Yano H., *et al.* (2006) *Science*, **312**, 1350-1353.
- [4] Abe M., *et al.* (2006) *Science*, **312**, 1334-1338.
- [5] Okada T., *et al.* (2006) *Science*, **312**, 1338-1341.