P231-007 **Room: 303** **Time: May 15 10:20-10:33**

Constraints on the formational and depositional mechanisms of regolith materials on the surface of Itokawa: Preliminary results

Hideaki Miyamoto[1]; Hajime Yano[2]; Sho Sasaki[3]; Hirohide Demura[4]; Akira Fujiwara[5]; Tatsuaki Hashimoto[6]; Naru Hirata[7]; Chikatoshi Honda[5]; Masateru Ishiguro[8]; Takashi Kubota[6]; Tatsuhiro Michikami[9]; Akiko Nakamura[10]; Ryosuke Nakamura[11]; Jun Saito[5]; Yasuhiro Yokota[5]; Akira Fujiwara HAYABUSA Sceince Team[12]

[1] Geosystem Engineering, Univ. Tokyo; [2] Dept. of Planetary Sci., JAXA/ISAS; [3] Mizusawa Obs., Nat'l Astron. Obs. Japan; [4] Univ. of Aizu; [5] ISAS; [6] JAXA/ISAS; [7] Kobe University; [8] UH; [9] Fukushima National College of Technology; [10] Grad. Sch. of Sci. and Tech., Kobe Univ.; [11] AIST; [12] -

http://www.geosys.t.u-tokyo.ac.jp/miyamoto

(This paper is also co-authored by D. Scheers at Univ Michigan, O. Barnouin-Jha at the Johns Hopkins Univ, R.W. Gaskell at CALTECH, and A. Cheng at Johns Hopkins Univ)

The AMICA imaging camera of the Hayabusa spacecraft reveals that the asteroid Itokawa has a variety of features, which suggest its complex evolutional history. Most notably in images at distance, two types of terrains (rough and smooth terrains) are recognized. While the nature of the rough terrain and the global views of Itokawa will be reported by several other researchers in the same session, in this talk we will report the results of our preliminary analysis of the smooth terrains.

The smooth terrains are featureless, flat part of Itokawa with almost uniform brightness, which indicates that these areas are covered by fine particulates (and these are practically called regolith). In planetary science field, regolith is generally defined as any kind of superficial layer/blanket of loose and small particulate rock materials, and in often cases, these are expected to form when meteoroids impact onto the asteroid surface. Although this happens regardless the size of asteroids, whether a small body keep regolith on its surface or not has been a significant unanswered question, especially because of the unknown mass balance between the regolith production rate and the loss rate under a significantly lower escape velocity. Thus, detailed studies of the nature of regolith would provide an important key in understanding the nature and origin of regolith materials on asteroids.

The regolith of Itokawa is not globally distributed; the smooth regolith terrains partially cover the surface of Itokawa. We identified several smooth terrains, whose detailed geological mappings are undergoing. Using three-dimensional shape-model of Itokawa, we measured the areas of each smooth area by carefully comparing the shape model and the images. We found that areally 20 % of the surface of Itokawa is covered by regolith.

The close-up images at altitudes lower than several hundred meters reveal that gravel-like grains uniformly cover the part of Muses Sea, which is the largest and the most distinctive smooth terrain. Preliminary analyses of these images suggest that the grain size of the gravel-like deposits likely ranges from sub-centimeter to centimeter scale, which is coarser than those of the pond deposits on Eros. This indicates that the evolutions of smooth terrains likely involve processes for grain-size sorting. We also noticed that certain dynamical inter-actions between regolith and boulders would have been present, although the transport/deposition mechanisms are subject to further investigation.

Other important findings through the preliminary analyses include: (1) Although the boundary between the smooth and rough terrains is generally sharp, there is a ~10 m-scale transition zone between them; (2) Boulder alignments along the boundary can be seen inside and near the transition zone; (3) The size of boulders inside the regolith area seems to become smaller gradually, as a function of the distance from the transition zone, when measured based on the lengths of shadows; (4) The depth of regolith may be several meters if the boulders inside the regolith are the remnants after the deposition of regolith; (5) The depth of the regolith appears to be shallower at the boundary between rough and smooth terrains than the middle of the Muses Sea; (6) Measured by the shades, the grain size of the regolith systematically becomes finer from the boundary to inside the Muses Sea.