CONSTRAINTS ON REACCRETION FROM ITOKAWA BOULDER DISTRIBUTIONS. C. M. Ernst[1], S. Mazrouei[2], O. S. Barnouin[1], M. Daly[2], [1]Johns Hopkins University Applied Physics Laboratory, Laurel, MD 20723 (carolyn.ernst@jhuapl.edu), [2]Dept. of Earth and Space Science, York University, Toronto, Ontaro, Canada.

Introduction: The Hayabusa spacecraft revealed the surface of the small asteroid 25143 Itokawa during its orbital rendezvous in 2005 [1]. Unlike the surface of Eros, where craters are plentiful, the surface of Itokawa has only ~38 crater candidates, only a small subset of which can be clearly identified as craters [2]. Instead, the surface of Itokawa is dominated by boulders. For many solar system bodies, impact craters provide the best means of characterizing their surface evolutions; for Itokawa, boulders fill this critical role. Itokawa's boulders have provided, for example, evidence indicating that the asteroid is a rubble pile [e.g., 1, 3-4] and that its present form is the result of the reaccretion of fragments from a catastrophic disruption event [1]. The boulders provide the best means of characterizing the surface evolution of Itokawa, including how surface material is mobilized, and may provide clues about its reaccretion history.

Boulder Data: A parallel project has produced an updated Itokawa boulder map [5] using the Small Body Mapping Tool [6]. Figure 1 shows the locations of the 820 identified boulders with semi-major axis > 5m. Cumulative distribution plots indicate a differing population of boulders on Itokawa's "head" versus its "body". The number density of large boulders on the head is significantly greater than on the body [5]. While analyses are still ongoing, an initial interpretation for this result is consistent with Itokawa being a contact binary and the head and body having experienced separate reaccretion environments before they were united.

Analysis: In this study, we focus on the distribution of boulders on the head of Itokawa to gain additional observational constraints on their accumulation. Furthemore, we are interested in how the reaccretion of the head and body might have altered the original boulder distributon and caused subsequent material movement.

On the "neck" of the asteroid, there appear to be two regions of accumulated boulders; one is on southern base of the head within the Muses-C region [7], while the other is on the northern edge of the head. The southern side of the head contains the steepest slopes observed on the asteroid (Fig. 2) and hosts relatively fewer boulders than the rest of the head, across which boulders appear to be more randomly distributed.

The initial finding that the head's boulders appear randomly distributed far from the contact point between the head and the body suggests that the head acculamated material from all directions during reaccreation, before uniting with the body. The subsequent collision between head and body was energetic enough to cause substantial surface flow, resulting in the boulder accumulations seen around the neck.

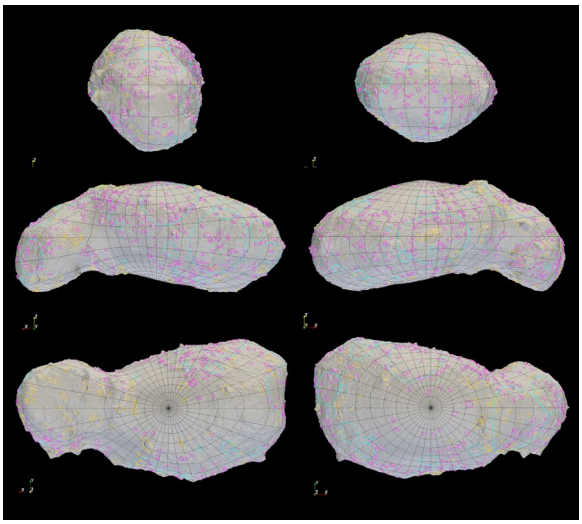

Figure 1. The distribution of boulders (pink and orange) > 5m across and candidate impact features (blue) on Itokawa.

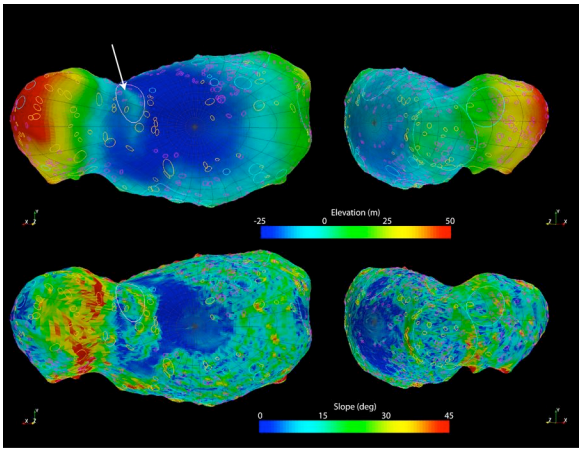

Figure 2. The elevations and slopes across the surface of Itokawa. The accumulation of debris on the southern side of the neck is indicated by an arrow.

References: [1] Fujiwara, A. et al. (2006) *Science*, 312, 1330-1334. [2] Hirata, N. et al. (2009) *Icarus*, 200, 486-502. [3] Saito, J. et al. (2006) *Science*, 312, 1341-1343. [4] Abe, S. et al. (2006) *Science,* 312, 1344-1347. [5] Mazrouei, S. et al. (2012) *LPS XLIII*, Abstract #2404. [6] Kahn, E.G. et al. (2011) *LPS XLII*, Abstract #1618. [7] Barnouin-Jha, O.S. et al. (2008) *Icarus*, 198, 108-124.