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Bright and Dark Regions on Itokawa: Evidence of Space Weathering

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HAYABUSA is an engineering spacecraft by the Institute of Space and Astronautical Science of Japan Aerospace Exploration Agency (ISAS/JAXA) aiming at sample return from asteroid (25413) Itokawa. Between September and November 2005, HAYABUSA observed Itokawa by Asteroid Multiband Imaging CAmera (AMICA). AMICA observed the whole surface of Itokawa with the solar phase angle around 10 degree from the Home Position (HP) (7km) with nominal resolution 70cm. The highest resolution during touch down phase is better than 1cm. One of most interesting surface feature of Itokawa is the heterogeneity in both color and brightness. The brightness difference is approximately 10-20% on distance images and as high as 30% on close-up images. Brighter areas are usually observed at local high zones and gravitationally steep zones. . Brighter areas are bluer in color and darker areas are redder. Although proximal darker areas are covered continuously with numerous boulders, bright areas are usually boulder-poor. High resolution images show strong evidence that bright surface was formed by removal of the superposed dark boulder rich layer. Compared with color observation [1] and experimental data [2, 3], we consider that space weathering degree of darker materials are stronger than that of brighter materials. A part of dark weathered surfaces with boulders were removed by shaking caused by impacts or planetary encounters, and underlying relatively fresh bright areas were exposed. References: [1] Saito J. et al. (2006) Science (submitted). [2] Sasaki S. et al. (2001) Nature 410, 555-557. [3] Sasaki S. et al. (2006) LPSC XXXVII #1705