はやぶさ２SCI/DCAM3による人工クレーターの形成と観測
Impact experiment on asteroid Ryugu by Small-Carry on impactor of Hayabusa-2 and observation of the impact ejecta by a Deployable CAMera-3

*荒川 政彦[1]、佐伯 孝尚[2]、門野 敏彦[3]、高木 靖彦[4]、和田 浩二[5]、飯島 祐一[2]、今村 裕志[2]、岡本 千里[1]、嶌生 有理[2]、白井 慶[2]、中澤 暁[2]、早川 雅彦[2]、平田 成[6]、矢野 創[2]、澤田 弘崇[2]、小川 和律[1]、石橋 高[5]、木村 宏[5]、小林 正規[5]、坂谷 尚哉[2]、早川 基[2]、本田 理恵[7]、杉田 精司[8]、諸田 智克[9]、亀田 真吾[10]、巽 瑛理[8]、本田 親寿[6]、横田 康弘[2]、神山 徹[11]、山田 学[5]、鈴木 秀彦[12]、吉岡 和夫[13]、長 勇一郎[8]、松岡 萌[2]
*Masahiko Arakawa[1], Takanao Saiki[2], Toshihiko Kadono[3], Yasuhiko Takagi[4], Koji Wada[5], Yu-ichi Iijima[2], Hiroshi Imamura[2], Chisato Okamoto[1], Yuri Shimaki[2], Kei Shirai[2], Satoru Nakazawa[2], Masahiko Hayakawa[2], Naru Hirata[6], Hajime Yano[2], Hirotaka Sawada[2], Kazunori Ogawa[1], Ko Ishibashi[5], Hiroshi Kimura[5], Masanori Kobayashi[5], Naoya Sakatani[2], Hajime Hayakawa[2], Rie Honda[7], Seiji Sugita[8], Tomokatsu Morota[9], Shingo Kameda[10], ERI TATSUMI[8], Chikatoshi Honda[6], yokota yasuhiro[2], Toru Kouyama[11], Manabu Yamada[5], Hidehiko Suzuki[12], Kazuo Yoshioka[13], Yuichiro Cho[8], Moe Matsuoka[2]

1. 神戸大学大学院理学研究科、2. 宇宙航空研究開発機構 宇宙科学研究所、3. 産業医科大学医学部、4. 愛知東邦大学 、5. 千葉工業大学惑星探査研究センター 、6. 会津大学　コンピュータ理工学部 、7. 高知大学自然科学系理工学部門 、8. 東京大学大学院理学系研究科地球惑星科学専攻 、9. 名古屋大学大学院環境学研究科 、10. 立教大学理学部 、11. 産業技術総合研究所 、12. 明治大学理工学部物理学科 、13. 東京大学大学院新領域創成科学研究科
1. Graduate School of Science, Kobe University, 2. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 3. University of Occupational and Environmental Health, 4. Aichi Toho University, 5. Planetary Exploration Research Center, Chiba Institute of Technology, 6. Dep. of Computer Science and Engineering, Univ. of Aizu, 7. Department of Science and Technology, System of Natual Science, Kochi University, 8. Department of Earth and Planetary Science, Graduate School of Science Sciece, The University of Tokyo, 9. Graduate School of Environmental Studies, Nagoya University, 10. School of Science, Rikkyo University, 11. National Institute of Advanced Industrial Science and Technology, 12. Department of physics, Meiji university, 13. Graduate School of frontier Science, The University of Tokyo

A small carry-on impactor (SCI) equipped on Hayabusa2 is scheduled to be propelled toward to the surface of asteroid Ryugu this spring. Cratering process on Ryugu made by the impactor will simultaneously observed by a deployable camera 3 (DCAM3) detached from Hayabusa2. The mission objective of the impactor is to excavate the asteroid to expose a subsurface material as ejecta deposits around the crater. Thus, not only it enables us to give a good opportunity for obtaining a fresh or subsurface material by a sampler system, remote sensing instruments such as ONC, TIR, NIRS3 onboard Hayabusa2 will also have a good chance to observe the exposed subsurface material. Furthermore, this impact experiment on Ryugu is also a rare opportunity to verify the crater scaling law in the microgravity environment on the real asteroid materials, and is expected to enable us to improve the conventional scaling law, especially for the crater size and the ejecta velocity distribution.

After arrival at Ryugu, the surface morphology observation through remote sensing has turned out that a plenty of boulders cover throughout the surface, and many of the boulders are larger than 10 m. These boulders are distributed almost uniformly and the size frequency distribution of the boulders is a power law distribution with the power law index around -1, indicating relatively large boulders are dominant on

the surface. Therefore, taking into account that the precision of an actual impact point toward an aiming point expands several 10 m, the impactor possibly collides with a large boulder, otherwise with small boulders having the power law size distribution, wherever the impactor would aim at on the surface of Ryugu. If the impactor collides with a large boulder, a crater should be formed in the strength regime, and if the impactor collides into a finer-boulder area, a crater will be formed in the gravity regime. The DCAM3 was designed for the observation of not only the impact cratering in the strength regime but also that in the gravity regime.

We believe that we will success to observe impact ejecta induced by the impactor when the SCI and DCAM3 operations are conducted as scheduled. We are planning to present a first report of the DCAM3 observation in this talk, and discuss how to search the impact point on the Ryugu surface using the DCAM3 images, beforehand the onboard imaging instruments. Moreover, the morphology of the ejecta curtain imaged by DCAM3 will bring us a lot of information about the crater formation process. We report the surface condition around the impact point, such as a large block or a small-boulders area, and an excavated area corresponding to the crater size. The DCAM3 will also observe individual dusts in the ejecta curtain to obtain information of the ejecta velocity distribution, so that we may have a chance to introduce these images. However, please note that this presentation strongly depends on the success of the SCI/DCAM3 operation.

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