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## **RESULTS OF HAYABUSA AND HAYABUSA2**

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## **ABSTRACT**

Hayabusa and Hayabusa2 are sample return missions from asteroids. The target asteroids are (25143) Itokawa and (162173) Ryugu respectively. They are small Near Earth Objects (NEOs), and in fact they actually approach the Earth quite closely. Therefore, the results of these missions are useful when we think about the planetary defense.

Hayabusa was launched in 2003, arrived at Asteroid Itokawa in 2005, and returned to the Earth in 2010. Itokawa is a 500m-sized S-type asteroid. We were surprised to see that the surface of Itokawa was covered by numerous boulders. One of the important discoveries by the remote sensing observations of Hayabusa was that Itokawa was not a single rock but it was a rubble pile. We also confirmed that the

surface composition is quite similar to that of the ordinary chondrite. We proved that ordinary chondrites come from S-type asteroids. In addition to these results, we found the evidence of space weathering for the surface materials and a variety of surface processes such as impact of meteoroids and particle motion.

Hayabusa2, launched in 2014, is now on the way to Ryugu. It will reach Ryugu in 2018 and will return to the Earth in 2020. The mission is basically similar to Hayabusa, but the Ryugu is a C-type asteroid with the size of about 900m. The most important science purpose is to study the organic matters and waters of a C-type asteroid. The remote sensing instruments of Hayabusa2 are a little different from those of Hayabusa, and they are Optical Navigation Camera, Near Infrared Spectrometer, Thermal Infrared Camera, and Laser Altimeter. Hayabusa2 also has one small lander and three small rovers. In addition to these, Hayabusa2 has an impactor to create a small crater on the surface of Ryugu. Using these instruments, we will reveal the nature of a small C-type NEO.

In this paper, we summarize what we know about Itokawa by Hayabusa mission, and what we will know about Ryugu by Hayabusa2 mission.

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