

HAYABUSA2 MISSION UP TO NOW. Y. Tsuda¹, M. Yoshikawa¹, S. Watanabe², S. Nakazawa¹, F. Terui¹, T. Saiki¹, T.-M. Ho³, A. MoussiSoffys⁴, S. Sugita⁵, N. Namiki⁶, K. Kitazato⁷, S. Tanaka¹, M. Arakawa⁸, S. Tachibana⁵, M. Ishiguro⁹, H. Ikeda¹, T. Okada¹, H. Demura⁷, M. Abe¹, K. Fujita¹, Y. Yamamoto¹, R. Jaumann³, J.-P. Bibring¹⁰, M. Grott³, K.-H. Glassmeier¹¹, and Hayabusa2 Project Team, ¹Japan Aerospace Exploration Agency (3-1-1 Yoshinodai, Chuo-Ku, Sagami-hara 252-5210, Japan, email: tsuda.yuichi@jaxa.jp), ²Nagoya University, Japan, ³DLR, Germany, ⁴CNES, France, ⁵University of Tokyo, Japan, ⁶NAOJ, Japan, ⁷University of Aizu, Japan, ⁸Kobe University, Japan, ⁹Seoul National University, Korea, ¹⁰Univ. de Paris Sud-Orsay, IAS, France, ¹¹TU-BS, IGEP, Germany.

Introduction: Hayabusa2 is the second sample return mission from asteroids. The target asteroid is (162173) Ryugu, which is a C-type near Earth asteroid. The main objective of science is to study the organic matters and the water at the beginning of the solar system. Demonstrations of some new technologies for small body explorations are also important purpose of Hayabusa2.

Hayabusa2 was launched on Dec. 3, 2014, and after the three and a half year journey in the space it arrived at its destination, Ryugu on June 27, 2018. Then we observed Ryugu by the remote sensing instruments on board, released two small rovers (MINERVA-II-1) and one lander (MASCOT), and carried out descent operations several times.

The touchdown operations to get the surface material and the impactor operation to create a small crater on the surface of Ryugu will be done in the first half of 2019. The spacecraft will leave Ryugu at the end of 2019 and return to the Earth at the end of 2020.

Asteroid Ryugu: We were able to get a lot of data of Ryugu since June 2018. The most noteworthy feature is its spinning-top shape covered by numerous boulders (Fig. 1). The science team of Hayabusa2 has done many studies about Ryugu, so here we do not mention the results of the scientific studies.



Fig.1 Hayabusa2 and Asteroid Ryugu
(The image of Ryugu was observed on June 26, 2018.)

Mission schedule: The mission schedule after arriving at Ryugu is summarized in Table 1. We have already done many operations in 2018. The next important operation is the first touchdown. At present, the first touchdown is scheduled in the middle of February 2019. The schedule of after the first touchdown will be changed by the results of it.

We will show the results of the first touchdown and the future mission schedule as well as the summary of the mission up to now.

Table 1 Hayabusa2 Mission schedule after arriving at Ryugu

Year	Month, Date	Event	Status
2018	June 27	Arrival at asteroid Ryugu (altitude 20 km).	Complete
	July 17 - 25	BOX-C operation (July 20, Altitude 6km).	Complete
	July 31 - Aug. 2	Medium altitude observations of Ryugu (Aug. 1, altitude 5 km).	Complete
	Aug. 5 - 10	Operation to measure gravity of Ryugu (altitude 851 m).	Complete
	Aug. 18 - Sept. 7	BOX-B operation (tour observation at altitude 20km)	Complete
	Sept. 10 - 12	Rehearsal 1 for Touchdown 1 (TD1-R1) (Sep. 12, altitude ~600m)	Complete
	Sept. 19 - 21	MINERVA-II-1 deployment operation (Sep. 21, altitude ~55m)	Complete
	Sept. 30 - Oct. 4	MASCOT deployment operation (Oct. 3, altitude ~51m)	Complete
	Oct. 14 - 16	Rehearsal 1A for Touchdown 1 (TD1-R1-A), (Oct. 15, altitude 22.3m)	Complete
	Oct.23 - 25	Rehearsal 3 for Touchdown 1 (TD1-R3), (Oct. 25, altitude 12m)	Complete
	Oct. 27 - Nov. 5	BOX-C operation, (Nov. 1, altitude 2.2km)	Complete
2019	Nov. - Dec.	Operation during solar conjunction	Complete
	Jan.	BOX-B operation (tour observation at altitude 20km)	-
	Mid Feb.	Touchdown operation	-
	Apr. - June	Crater generation & touchdown operation	-
	July	MINERVA-II-2 deployment operation	-
	Aug. - Nov.	Hayabusa2 remains near the asteroid	-
	Nov. - Dec.	Departure from Ryugu	-