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**Hayabusa2 – Sample Return and Kinetic Impact Mission
to Near-Earth Asteroid Ryugu**

**Yuichi Tsuda⁽¹⁾, Makoto Yoshikawa⁽²⁾, Saiki Takanao⁽³⁾, Satoru Nakazawa⁽⁴⁾
and Sei-ichiro Watanabe⁽⁵⁾**

⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾*Institute of Space and Astronautical Science, JAXA,
3-1-1, Yoshinodai, Chuo-ku, Sagami-hara, Kanagawa, Japan, tsuda.yuichi@jaxa.jp*

⁽⁵⁾*Graduate School of Environmental Studies, Nagoya University,
Fro-cho, Chikusa-ku, Nagoya, Aichi, Japan, seicoro@eps.nagoya-u.ac.jp*

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ABSTRACT

The Japan Aerospace Exploration Agency launched an asteroid sample return spacecraft "Hayabusa2" on December 3, 2014 by the Japanese H2A launch vehicle. Following the successful return back of Hayabusa from the asteroid 25143 Itokawa, Hayabusa2 aims at the round trip mission to the asteroid 162173 Ryugu. Ryugu is a near-Earth C-type asteroid, which is believed to contain organic and hydrated minerals. Thus it is expected that its successful sample return may provide fundamental information regarding the origin and evolution of terrestrial planets as well as the origin of water and organics delivered to the Earth.

Hayabusa2 will reach Ryugu in the middle of 2018 and perform an asteroid proximity operation for 1.5 years. Three touch downs for sample collection and one crater forming by a high-speed kinetic impact are planned during the asteroid proximity operation. The sample is to be brought back to the Earth by a re-entry capsule in December 2020.

Hayabusa2 successfully conducted the Earth gravity assist (EGA) operation on December 3, 2015, passing above Hawaii islands at the altitude of 3090km, and increasing the interplanetary flight velocity by 1.6km/s. After the EGA, the spacecraft started extensive ion engine operation for orbit maneuver toward Ryugu rendezvous in 2018. This paper briefly introduces about the mission objective and spacecraft design, and then describes the first two and a half year operation including launch, Earth gravity assist and ion engine-powered cruise operation. The paper also provides a detailed operation plan for the asteroid proximity operation. Finally a significance of the mission to future planetary defense technologies will be discussed mainly focusing on the engineering point of view.

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