

Message from the Guest Editors of the Special Issue on Astrodynamics and Engineering Aspects of Hayabusa2—Sample Return Mission to the Asteroid Ryugu

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Dear authors and readers,

Since the beginning of the space age, the return of samples from the other celestial bodies has been deemed one of the ultimate forms of unmanned robotic missions. Realizing a sample return mission requires profound knowledge of many wide and different areas of engineering and science. In a special way, astrodynamics plays a crucial role throughout the mission, ranging from accurate guidance and navigation to distant bodies, to precise modeling of dynamical environment of target bodies, precision landing to an aimed point, various surface and proximity activities around the bodies, and orbit design for the round-trip journey.

Hayabusa2 is the world's second asteroid sample return mission following the first Hayabusa mission. It aims at a carbon-rich asteroid 162173 Ryugu. Hayabusa2 was launched in December 2014 and arrived at Ryugu in June 2018. Since then, it has been unveiling astonishing environment of this unexplored-before-2018 asteroid. In parallel with the scientific discoveries, Hayabusa2 has been accomplishing many innovative engineering attempts on the Ryugu surface, such as delivering four mobile landers, two precision landings with the accuracy less than 1 m, and generating an artificial crater with the diameter larger than 10 m. The spacecraft left Ryugu in November 2019 and is now on the way back to Earth.

This special issue covers various key contributions from the field of astrodynamics which led the mission to a complete success so far, such as the optical navigation, landing strategy, crater forming experiment, modeling Ryugu for precise GNC, asteroid-proximity activities considering the dynamical environment of Ryugu, and so forth. This special issue hosts some mission designers of Hayabusa2, and members of the Hayabusa2 astrodynamics science team. Thus, this issue becomes one of the timely collections of papers with fresh outcomes, and new achievements of the mission.

Finally, we do like to give our best thanks to all the contributors to this special issue.

Sincerely,

Yuichi Tsuda

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Christian Circi

Giovanni Vulpetti