

## **Asteroid sample return mission Hayabusa2**

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Hayabusa, the world's first asteroid sample return mission, explored a tiny, S-type near earth asteroid Itokawa in 2005 and brought back its surface material in 2010. We learned a lot of interesting facts for the planetary science. As the follow-on mission of Hayabusa, and as the world's second asteroid sample return mission, Hayabusa2 was launched in 2014. We have started a new challenge or adventure to an asteroid again. The target of Hayabusa2 is Asteroid (162173) 1999 JU3, which is C-type. The scientific purpose is to study not only the formation and evolution of the solar system but also the organic matter and water, which existed in the early stage of the solar system.

Since we have the experiences of Hayabusa, we modified the spacecraft in a lot of parts. Thus the spacecraft becomes much more robust and reliable with some new technological challenges. One of the new challenges is an impactor, which will create a small crater on the surface of the asteroid. The spacecraft will touch down to the crater to collect the subsurface materials in addition to the surface materials. Hayabusa2 has four remote sensing instruments; the optical navigation camera, the laser altimeter, the near infrared spectrometer, and the thermal infrared camera. It has one small lander MASCOT provided by DLR and CNES, and three small rovers MINERVA-II. Therefore, we can study 1999 JU3 by remote sensing observations from the spacecraft and by in situ observations by the lander and the rovers as well as by the analysis of the returned samples.

Hayabusa2 was launched on 3rd December 2014, and it goes around the sun near the orbit of the earth for first one year. In December 2015, it will come back to the earth to perform the Earth swingby. Hayabusa2 will arrive at 1999 JU3 in June or July of 2018, stay there for one and half years. Leaving the asteroid at the end of 2019, Hayabusa2 will come back to the earth at the end of 2020. Then sample analysis will start.

Hayabusa2 is carried out under the international collaborations. We collaborate with USA and Australia in the similar way as the original Hayabusa mission and also collaborate with European countries such as Germany and France. We do hope that we will have a breakthrough for the understanding our solar system by the Hayabusa2 mission.