Hayabusa2: A Mission to reveal the material evolution on a C-type asteroid Ryugu

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The Hayabusa2 mission journeys to a C-type near-earth asteroid (162173) Ryugu (1999 JU_3) to conduct detailed remote-sensing observations and return samples from the surface. The Haybusa2 spacecraft developed by Japan Aerospace Exploration Agency (JAXA) was successfully launched on 3 Dec. 2014 by the H-IIA Launch Vehicle and performed an Earth swing-by on 3 Dec. 2015 to set it on a course toward its target. The spacecraft will reach Ryugu in the summer of 2018, observe the asteroid for 18 months, and sample surface materials from up to three different locations. The samples will be delivered to the Earth in Dec. 2020.

Ground-based observations of Ryugu have obtained a variety of optical spectra. Some reported absorption ~0.7 μm, and steep red slope in the short wavelength region, suggesting hydrated minerals. Some others, however, obtained flat spectra without such features. This variety may reflect surface chemical inhomogeneity. Through deciphering memories recorded on the asteroid, Hayabusa2 aims at increasing our knowledge of the material mixing and transfer processes in the early solar system, mineral-water-organic intereactions on planetesimals, and dynamical processes, such as impact [1].

Hayabusa2 carries a sampler and four onboard remote-sensing instruments: a multi-band optical imager (ONC-T), a laser altimeter (LIDAR), a near infrared spectrometer covering 3-μm absorption band (NIRS3), and a thermal infrared imager (TIR). It also has three small rovers of MINERVA-II and a small lander MASCOT (Mobile Asteroid Surface Scout) developed by German Aerospace Center (DLR) and French space agency CNES. Further, Hayabusa2 has impact experiment devices, which consist of a small carry-on impactor (SCI) excavating underground materials and a deployable camera (DCAM3) to observe the ejecta curtain. The interdisciplinary research using the data from these onboard and lander's instruments and the analyses of returned samples is the key to the success of the mission.

[1] Tachibana *et al*. (2014) *Geochem. J.* **48**, 571-587.