

Japanese future plans for exploration of primitive bodies in the solar system

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More than two years has passed since the exploration of Itokawa by Hayabusa spacecraft. For the first time, we saw real appearance of a very small solar system body, whose size is only about 500 m in length. We had a lot of scientific results from the observation of Hayabusa, and we got many clues to know the origin and evolution of the solar system. At present (February 2008), the daily operations of Hayabusa are being done for its earth return in June 2010.

As working for Hayabusa, we have also considered post-Hayabusa missions. Since the Itokawa is an S-type asteroid, next target should be a C-type asteroid, because these two types are abundant in the main asteroid belt. The next mission to Hayabusa is 'Hayabusa-2', which will explore C-type asteroid. The spacecraft is quite similar to Hayabusa, so we can save time for manufacturing it. The current target asteroid of Hayabusa-2 is 1999 JU3, which is intensively observed in 2007 and 2008. At the same time, we were also considering much more advanced mission after Hayabusa-2, and this mission is called 'Hayabusa-Mk2.' The target of Hayabusa-Mk2 should be much more primitive objects such as P-type or D-type asteroids, CAT, and comets, and the spacecraft is a newly developed one. In this way, we (=JAXA) are considering programmatic missions for the exploration of primitive bodies. Since there are many small bodies in the solar system, we should have such strategic approach.

From 2006, Hayabusa-Mk2 is also considered under the scheme of Cosmic Vision of ESA with the European study group for small bodies of the solar system. And it was proposed to Cosmic Vision with the name of 'Marco Polo.' It has passed the first selection so now we are in the assessment phase. The spacecraft, for which Japan is responsible, is based on the idea of Hayabusa-Mk2, but we reconsider it to have a large lander and a new sampling system from Europe.

There are four principal purposes for asteroid exploration, that is, science, spaceguard, resources, and manned mission. The science is the main target and we want to know the origin and evolution of the solar system and the life. And now, the other purposes, spaceguard and resources, are becoming important, too. Moreover Near Earth Asteroids are now considered as good targets for manned missions after the Moon but before Mars. The long-ranged exploration plan and international collaborations will be more important from now on.