On the exploration of small solar system bodies in the post-Hayabusa era

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Two years has almost passed since the exploration of Itokawa by Hayabusa spacecraft. Hayabusa is in a severe situation, but at present (February 2007), the daily operations are being done for its earth return in June 2010.

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 form the observation of Hayabusa, and we got many clues to know the origin and evolution of the solar system. After having such results of Hayabusa, we are now considering 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. We call the mission to a C-type asteroid as 'Hayabusa-2.' The mission is quite similar to the Hayabusa mission, and now we have one candidate asteroid for the target and we are investigating about the orbit or the system of spacecraft. The targets after Hayabusa-2 should be much more primitive objects such as P-type or D-type asteroids, CAT, and comets. We also studying for the mission to these objects, and we call this mission as 'Hayabusa-Mk2', which will use a new type spacecraft. We want to carry out these two missions successively after Hayabusa mission.

If we look at the current situation of the world, we find that small bodies like Itokawa, which have not been taken notice much before, are now considered to be very interesting objects for explorations by many peoples. In Europe and USA, several studies have already started to make planes of explorations to small solar system bodies. Various kinds of missions, from the similar mission to Hayabusa-2 to a future manned mission to asteroids, are considered. Some missions are considered only in one country, others are discussed internationally. Since there are a lot of the small bodies in the solar system, we should collaborate internationally to maximize the output. As for Japan, we are one step ahead of other countries because of Hayabusa mission. So we can take the leadership for such kind of mission like Hayabusa.

There are three purposes for asteroid exploration, and they are science, spaceguard, and resources. Up to now, the science is the main target and we want to know the origin and evolution of the solar system and the life. From now on, the other purposes of spaceguard and resources will become more important. Since there will be many missions to small solar system bodies in future, the long-range plan of exploration to these bodies is very important.