SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (4)

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HAYABUSA2 EARTH SWING-BY OPERATION RESULTS

Abstract

This paper describes the earth swing-by operation of Hayabusa2. Hayabusa2 is a Japanese interplanetary probe launched on December 3, 2014 to visit asteroid "Ryugu". It is a sample return mission like Hayabusa, but the spectrum type of the target asteroid is different from Itokawa, Hayabusa's target body. Itokawa is S-type asteroid but Ryugu is C-type asteroid. C-type asteroids are believed to contain more organic matter and hydrated mineral. Hayabusa2 is scheduled to reach Ryugu in the middle of 2018 and will perform an asteroid proximity operation for 1.5 years. Three touch downs for collecting the asteroids sample and one 2m class-crater generation by a kinetic impact are planned during the asteroid proximity operation. The collected sample will be brought back to the Earth by the re-entry capsule in 2020. Hayabusa2 is equipped with a high-specific ion engine system to enable the round-trip mission. The ion engine system can provide larger than 2 km/s delta-V with very small amount of xenon propellant. First one year after launch is an interplanetary cruise phase called EDVEGA (Electric Delta-V Earth Gravity Assist) phase. The transfer orbit to the asteroid is connected with the EDVEGA orbit by the Earth swing-by. After the launch, several ion engine commission operations have been successfully conducted and three long- term ion engine maneuvers were also conducted to direct the spacecraft onto the Earth swing-by corridor. The last two months before the swing-by was the precise navigation / guidance phase to the Earth swing-by. During this phase, trajectory correction maneuvers by the chemical reaction control system (RCS) were conducted. As a result, Hayabusa2 successfully performed the Earth swing-by on December 3, 2015 and it is now on its target orbit to the asteroid. This paper describes how the guidance / navigation operations were conducted around the Earth swing-by. A lot of science observation were also performed during this phase. This paper also shows the result of the science observations.