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## LOCALIZATION SYSTEMS AND RECOVERY OF HAYABUSA2 SAMPLE RETURN CAPSULE

**Abstract**

Asteroid Explorer Hayabusa2 returned to the earth in Dec. 2020. After successive TCMs (trajectory correction manoeuvre) were carried out, the SRC (sample return capsule) was separated from the spacecraft and entered the earth atmosphere with the velocity of about 12 km/s. Passing through the severe aerodynamic heating corridor, SRC jettisoned both of the forebody and aftbody heatshields and deployed the parachute at the altitude of about 10km. On deployment of the parachute, SRC started transmitting the beacon signal, based on which the ground direction finding stations (DFS) localized SRC with excellent accuracy. All the components of SRC have been successfully recovered at localized position on the ground. The present paper summarizes and reports the localization systems and recovery operation of Hayabusa2 SRC. In advance to the actual recovery operation, the reentry flight trajectory was carefully predicted based on the final orbital determination values and wind prediction on the very day, which were circulated among DFS teams for determining stand-by azimuth directions. In the recovery operation, localization strategies not only in nominal case but also in contingency cases such as abnormal parachute deployment, malfunctions in the beacon transmission and heatshield separation errors etc. are very important for securing redundancy. The ground optical observation stations and airborne observations during the fireball phase of aerodynamic heating are thought to be useful for reconstruction of reentry trajectory of SRC even in case of beacon malfunction. In addition to them, marine-radar systems, C-band radar systems are used for covering and improving localization capability. Even after localization was done, the drone system gave us accurate information of the pin-point landed position. The localization results in the overall Hayabusa2 recovery operation are quantitatively shown and discussed compared with the predictions and actual recovery site.