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Hayabusa 2 and OSIRIS-REx: international collaborations on sample retrun missions

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CONNOLLY JR., Harold C.[1*] ; LAURETTA, Dante S.[2] ; TACHIBANA, Shogo[1] ; YOSHIKAWA, Makoto[3]
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[1]Dept. of Natural History, Hokkaido Univ. Sapporo 060-0810, Japan, [2]LPL, Univ. of Arizona, Tucson, AZ 85721, USA, [3]ISAS, JAXA, Sagamihara, Kanagawa 252-5210 Japan
[1]Dept. of Natural History, Hokkaido Univ. Sapporo 060-0810, Japan, [2]LPL, Univ. of Arizona, Tucson, AZ 85721, USA, [3]ISAS, JAXA, Sagamihara, Kanagawa 252-5210 Japan

The Origins Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) asteroid sample return mission was selected by NASA in May 2011 as the third New Frontiers mission. The target, (101955) Bennu, is a B-type asteroid, hypothesized to be similar to CI or CM carbonaceous chondrites. The key science objectives of the mission are summarized in [1] with the major goal of returning pristine asteroid regolith. It is scheduled to launch in September 2016. Hayabusa2 is an asteroid sample return mission to the C-type asteroid, 1999 JU_3, and builds off of the successful Hayabusa mission, the first mission to return a sample from an asteroid. Hayabusa2 launched in December 2014.

The OSIRIS-REx science team is an international team including Co-Is and collaborators from the United States, Canada, France, and the United Kingdom with the Canadian Space Agency contributing an instrument (OSIRIS-REx Laser Altimeter) to the mission [2]. In addition, in November 2014, a Memorandum of Understanding (MOU) was signed between NASA and JAXA for cooperation between the Hayabusa2 and OSIRIS-REX missions. The Hayabusa2 science team is an international team including Co-Is and collaborators from Japan, Germany, France, the United States, Korea, the United Kingdom, Australia, Switzerland, and Italy. A lander MASCOT (Mobile Asteroid Surface Scout) for the Hayabusa2 was developed by DLR and CNES [3].

The official collaboration between the Hayabusa2 and OSIRIS-REx as defined in the MOU presents an important series of challenges for both missions. These challenges focus on sharing data from both science and engineering elements of the mission, including during asteroid operations and, ultimately, sample analysis and actual returned samples. It also provides an opportunity for the two missions to learn about each cultural systems and how both science and engineering are approached from the human element. The two projects will develop a mutually agreed upon Joint Sample Exchange Curation and Analysis Plan that will support the mutual participation of scientist in both missions.

Hayabusa2 and OSIRIS-REx are sample return missions, and the exchange of samples between the two agencies will occur, building on lessons learned from the past. From JAXA, a total of 10% by mass of a representative and unprocessed portion of the returned Hayabusa2 sample will be jointly separated for full transfer to NASA no later than 1 year after Earth return. NASA will deliver a total of 0.5% by mass of the OSIRIS-REx sample no later than 1 year after Earth return and will jointly separate a representative and unprocessed sample. A key challenge for the two missions and agencies will be to determine and agree upon what constitutes a representative sample, in part because any agreed upon criteria for establishing what is representative could inevitably need to be re-evaluated upon sample return do to unexpected results in sampling.

[1] Lauretta et al. (2014) The OSIRIS-REx Target Asteroid 101955 Bennu: Constraints on its Physical, Geological, and Dynamical Nature from Astronomical Observations. Meteorit. Planet. Sci. 49. [2] Dickinson et al. (2012) AN OVERVIEW OF THE OSIRIS REX LASER ALTIMETER OLA. 43rd LPSC 1447. [3] Lange et al. 7th International Planetary Probe Workshop Proceedings, Barcelona, Spain. 2010.

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