Ensuring the Long-Term Scientific Value and Impact of Astromaterials Samples Data from Past, Present, and Future NASA Sample-Return Missions

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Among the most precious and costly samples analyzed by geochemists are materials that are collected by spacecraft from extraterrestrial locations and returned to Earth. Such samples include, for example, the rocks collected on the Earth's Moon by the Apollo mission, specimens from asteroids (Hayabusa and Hayabusa2 missions), and solar wind collected by the Genesis mission. Most recently in 2020, the OSIRIS-REx mission collected sample from the asteroid Bennu that are en route back to Earth, expected to arrive in September 2023.

Samples returned by spacecraft missions and curated by the Astromaterials Research and Exploration Science Division (ARES) at the NASA Johnson Space Center have been analyzed in thousands of studies in laboratories around the world and generated a vast amount of analytical data that form the foundation of our knowledge about the origin and evolution of the Solar System. These data need to be openly accessible to the research community so they can be used to generate new knowledge in the future.

The Astromaterials Data System ensures that analytical data of astromaterials samples collected and curated by NASA can be accessed and reused with confidence by the global research community in compliance with principles of Open Science and FAIR research data. Astromat operates services for researchers to deposit and publish their data and to explore and mine a large-scale synthesis of astromaterials samples data that integrates >50 years of laboratory analytical data for NASA's astromaterials collections. Since late 2022, Astromat has been upgrading its infrastructure and services to function as the future home for data generated by the OSIRIS-REx Sample Analysis Mission. Samples returned from asteroid Bennu will be analyzed by the OSIRIS-REx Sample Analysis Team (SAT) using a wide range of analytical methodologies and instrumentation. Data generated in participating labs will be delivered to and managed by the Sample Analysis Micro-Information System (SAMIS), a centralized data storage and sharing platform for mission use. SAMIS will deliver the data to Astromat to be preserved and made publicly accessible after the completion of the OSIRIS-REx Sample Analysis Mission. Infrastructure, policies, and procedures are currently put in place for this data pipeline.