PRIMITIVE ASTEROIDS SPECTROSCOPIC SURVEY – PRIMASS: CURRENT STATUS

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Abstract

We present the current status of our PRIMitive Asteroids Spectroscopic Survey (PRIMASS), a catalog of visible and near infrared spectra of primitive main belt asteroids. Created to provide context to the scientific return of both OSIRIS-REx and Hayabusa2 missions, currently orbiting two primitive near-Earth asteroids (NEAs), PRIMASS will map the primitive material in the inner Solar System, which includes water and organics.

1. Introduction

Studying primitive asteroids is a fundamental task in understanding the origin of volatile and organic material in the Solar System, since they harbor information about the pre-existing compounds in its early stages. Primitive asteroids in the main belt, in particular those that belong to collisional families, are considered to be the most likely source of primitive NEAs, among which are included (101955) Bennu and (162173) Ryugu, targets of the OSISIS-REx and HAYABUSA2 sample return missions, respectively. Therefore, spectral data from main belt primitive asteroids are key for providing context and enhancing the scientific outcomes of those missions. Besides, the discovery of water ice on the surfaces of two primitive asteroids, 24 Themis and 65 Cybele [1][2], placed the focus on the outer-belt (orbits with semi-major axis larger than 2.82 au), where more asteroids could harbor water ice on or below the surface.

2. The PRIMASS survey

In 2010 we started our PRIMitive Asteroids Spectroscopic Survey (PRIMASS) with the goal of studying the surface of primitive asteroids at different locations in the main belt, by means of visible and near-infrared spectroscopy [3][4][5][6][7][8]. As of May 19, this survey gathers spectra of about 600 asteroids from 10 families and two groups of asteroids that had been sparsely studied before (85% of our targets did not have published spectra and only 40% had visible photometry). PRIMASS uses a variety of ground-based facilities, the majority of the visible spectra being obtained with the 10.4m Gran Telescopio Canarias (GTC), located at the El Roque de Los Muchachos Observatory (ORM, La Palma, Spain). Most of the near-infrared spectra are obtained using both the 3.6m Telescopio Nazionale Galileo (TNG), located also at the ORM, and the 3.0m NASA Infrared Telescope Facility (IRTF) on Mauna Kea (Hawaii, USA). We have also used other telescopes like the 4.1m Southern Astrophysical Research Telescope (SOAR, participated by NOAO), at Cerro Pachón (Chile), or the 3.6m New Technology Telescope (NTT), located at la Silla Observatory. The survey is on-going and is expected to contain about ~900 spectra by the end of 2020.

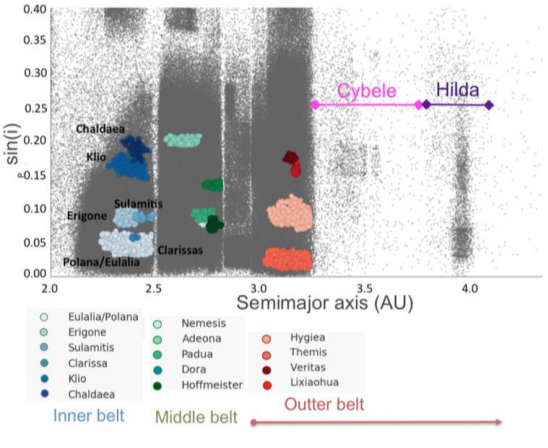

Figure 1. *Distribution of the currently identified primitive families in the asteroid belt. We include also Cybele and Hilda dynamical groups.*

3. PRIMASS-L

As part of the PRIMASS survey, we have also created the PRIMASS Library (PRIMASS-L), that will contain the results of PRIMASS. This is a 2-year project which aims to archive PRIMASS spectra at the Small Bodies Node (SBN) of the NASA Planetary Data System (PDS). SBN-PDS is largely responsible for archiving the data pertaining to small bodies. The SBN archives observations from ground-based facilities, including ground-based surveys and other mission data. The SBN datasets are available on-line for browsing and downloading. Archiving data at the PDS is a peer-reviewed process. We plan to upload the data in two steps, starting the last semester of 2019. In addition to the spectra, we plan to upload the results from the spectral analysis we have carried out and published, which includes measurements of spectral slopes and characterization, if present, of the absorption band centered at 0.7 microns and associated to hydrated silicates. Making PRIMASS-L publicly available at the Small Bodies Node of the Planetary Data System (SBN- PDS, NASA) will enable synergies with other data sets containing physical parameters (e.g. polarimetric properties and geometric albedo) and family affiliation. This will push the characterization of the families and of primitive material to a new level and improve our understanding of the evolution of our Solar System and other planetary systems.

4. Summary

PRIMASS is the largest spectroscopic survey on primitive asteroids so far, and it continues gathering visible and near-infrared spectra. Making PRIMASS data publicly available via PRIMASS-L at the Small Bodies Node of the Planetary Data System (SBN-PDS, NASA) will enable synergies with other data sets containing physical parameters (e.g. polarimetric properties and geometric albedo) and family affiliation. This will push the characterization of the families and of primitive material to a new level and improve our understanding of the evolution of our Solar System and other planetary systems.

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6. References

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