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PRIMitive Asteroids Spectroscopic Survey Library PRIMASS-L: latest results

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Abstract

In this work we present current progress on our PRIMitive Asteroids Spectroscopic Survey Library: PRIMASS-L. This is a compilation of visible and near-infrared spectra of primitive asteroids in the main belt, obtained in the frame of the PRIMASS survey. PRIMASS-L will enhance the scientific return of the two current missions exploring primitive NEAs. In addition, it will serve as a quality check for the Gaia spectroscopic products to be released by 2021.

1. Introduction

The study of primitive asteroids is relevant to the origin and nature of volatile and organic material in the early Solar System. Furthermore, it provides a rich source of information about the organic compounds naturally present during the prebiotic evolution of the asteroids and terrestrial planets. Spectral data from primitive asteroids that could be the source of the primitive near-Earth asteroids (NEAs) is key to provide context and enhance the scientific outcomes of the two current sample-return missions orbiting primitive NEAs (OSIRIS-REx and Hayabusa2). Concurrently, 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]. Here we present PRIMASS-L, a spectral library that will contain the results of PRIMASS. As of May 19, this library 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 (Hawai, 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. This survey is on-going and is expected to contain about ~900 spectra by the end of 2020.

3. PRIMASS-L

This is a 2-year project that aims to archive PRIMASS-L at the Small Bodies Node (SBN) of the NASA Planetary Data System (PDS). PRIMASS-L will contain the results of the PRIMASS survey, gathering spectra of ~600 asteroids from 10 families and two groups of asteroids. 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.

The archive will consist on a simple "tree" of folders, one for each family containing the .txt files with the spectra, the results of our spectral analysis, and other accompanying information.

1. **Updated .txt info of the PRIMASS-L**: this refers to the abstract, description, and confidence levels that describe the whole sample. It also includes the codes for the references. All of this will appear as part of the **dataset.cat**.
2. **index.tab**: this step requires extracting data from the papers and some times also from the image headers of from the logs of the observations.
3. **ASCII spectral tables**: three-column .txt files containing wavelength, reflectance, and error. They will be flagged (bad data and telluric bands).
4. **Tables with results/physical parameters**: in the form of .txt files with spectral slopes, and characteristics of the bands, if present.

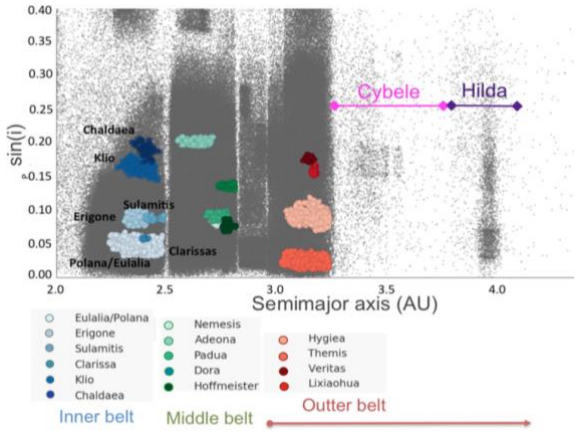

Figure 1: Distribution of the currently identified primitive families in the asteroid belt. We include also Cybele and Hilda dynamical groups.

4. Summary

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. polarymetric 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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