# Spectroscopy of primitive asteroids: searching for the distribution of water in the inner Solar System

Primitive asteroids in the Main Belt are considered among the most ancient and least-altered bodies in the Solar System. These objects are believed to preserve chemical signatures from the early solar nebula, including water-bearing minerals and organic compounds that may be linked to the emergence of life on Earth. Understanding their composition provides crucial insight into the processes that shaped the early Solar System and the possible pathways by which volatiles, including water, were delivered to the inner planets.

This research project focuses on identifying and analyzing spectroscopic indicators of aqueous alteration in primitive asteroids. Specifically, we aim to detect key spectral features such as the near-ultraviolet (NUV) absorption edge below 0.4 μm and the 0.7 μm absorption band - both associated with phyllosilicates, minerals formed through interaction with liquid water. These features are faint and lie in spectral regions that are difficult to observe from the ground due to atmospheric limitations.

To address this challenge, we are using two of the world's largest optical telescopes: the 10-meter Southern African Large Telescope (SALT), with extended sensitivity into the NUV range (down to 0.32 μm), and the 10.4-meter Gran Telescopio Canarias (GTC), optimized for high-quality visible-range spectroscopy. The project's observational campaign, conducted over two years, aims to acquire spectra for approximately 70 primitive asteroids.

In parallel, the project includes the identification and spectroscopic analysis of solar analog stars - stars with properties closely matching those of the Sun - to serve as calibration references. This step is particularly critical for improving the accuracy of reflectance spectra in the NUV, a range especially sensitive to calibration errors.

Preliminary observations have already been conducted on 26 asteroid targets, as well as on several candidate solar analog stars. The acquired spectra are processed through a rigorous reduction and calibration, allowing for detailed analysis of absorption features and taxonomic classification. The data will be used to explore potential correlations between spectroscopic characteristics, such as hydration signatures, and physical or dynamical parameters like asteroid size, orbital distance, or family affiliation.

The anticipated outcomes of this project include a refined understanding of the distribution of hydrated minerals among primitive asteroids and a deeper insight into their role in the early delivery of water and organics to Earth. It will help illuminate the conditions of the early Solar System and provide evidence for the processes that may have led to life-supporting environments on Earth and possibly elsewhere.