Photometric Analysis of a Newly Discovered Main-Belt Comet

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Introduction

Main Belt Comets (MBCs) are a class of objects in the main asteroid belt that exhibit comet-like activity. The nucleus of a MBC plays a crucial role in understanding its activity and evolution.
This project focuses on the photometric analysis of a newly discovered MBC, with the primary goal of characterizing its nucleus. This MBC was observed at its inactive phase.

Objectives

The main objectives of this project are as follows:

- To perform photometric calibration on the images (already reduced for bias and flat-field) of a recently discovered main-belt comet.

- To perform a photometric analysis on the inactive nucleus.

- To determine the absolute magnitude of the inactive nucleus.

- To compare the absolute magnitude of the inactive nucleus with those of other MBCs documented in the literature.

Methodology and Resources

To achieve these objectives, the student will:

- Utilize images captured with the Gemini North Telescope in July 2023, that are proprietary and provided by Maria Mastropietro, a PhD student at the Institut für Geophysik und Extraterrestrische Physik.

- Analyze the images using SAOImageDS9.

- Search for the photometric zeropoint in the images using the Pan-STARRS1 (PS1) catalog for photometric calibration.

- Conduct photometry on the images using the Image Reduction and Analysis Facility (IRAF).

- Generate a plot of absolute magnitude versus true anomaly using Python, to visualize the activity strength of the MBC.

- Calculate the magnitude of the inactive nucleus.

- Compare this value with published data on inactive nuclei of other MBCs, searching for references in NASA/ADS.

Significance

Knowing the absolute magnitude of the inactive nucleus of a MBC is essential to facilitate detailed analyses of its activity strength during active periods and for comprehensive studies of its activity and evolution. This project contributes to the growing body of knowledge about MBCs and aids in the characterization of these objects.