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A program to identify dormant comets among the NEO population

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Introduction

The population of Near Earth Objects (NEOs) is expected to be frequented by about 6±4% of extinct Jupiter Family Comets (JFCs) [1, 2]. Such objects are also dynamically characterized by exhibiting Tisserand criterion values $T_J \leq 3$ [3]. A continuous monitoring of these dark objects when experiencing close approaches with the Earth is feasible for middle-sized telescopes, and can provide insight on their size distribution [4]. They are also exhibiting extremely low albedos with surface reflectivity typically below 0.04. To perform a continuous monitoring of dormant comets, and other unusual bodies inside the NEO population is interesting because they are ending bodies that inform us on the decay of JFCs, and the production of meteoroid streams [5, 6].

Methods

We are currently performing this monitoring by using medium aperture telescopes and a standardized photometric method for a 10 arcsec aperture in order to detect cometary activity in different filters (typically V, R, I and CO) of the Johnson-Kron-Cousins system. Our photometric coverage consists of a continuous study of the magnitude, and FWHM of these objects in the above mentioned filters with instruments ranging from 0,3 to 0.8m in diameter (Table 1).

In order to achieve such a goal we are conducting a monitoring program of ground-based photometry of NEOs by using U, V, R, I filters. Our selected targets typically have T_J in or near the cometary range. For precise calibration in the different filters, we would use the Landolt standard fields [7] and the Stetson extended fields [8].

Observatory (MPC code)	Instrument
Gualba, Barcelona (442)	SC 36.0 f/6
Guadarrama, Madrid (458)	SC 20 f/10
IAC80, Obs. Teide, Tenerife.	C 80 f/11.3
La Cañada, Ávila (J87)	RCT 40.0 f/10
Montsec Astronomical Observatory (OAdM)	SC 80.0 f/10

Table 1. Observatories involved in the present studies.

Preliminary results and conclusions

The different NEO candidates to be dormant comets that have been studied so far by our team exhibit a typical stellar appearance. Guided exposures are added to have good signal/noise ratios in order to clarify the absence of cometary activity from the FWHM curves (see e.g. Fig. 1). Additional photometry is performed in the above mentioned bands in order to derive the colour indexes.

Among the population of Near-Earth Objects (NEOs) more systematic investigations of the reflectance properties are required. It has been suggested that at the end of their active life some comets develop an asteroidal appearance when sublimation stops and reach dormancy or extinction. It is supposed to be consequence of depletion of volatile phases. We propose a systematic study of the surface colors of several NEOs in order to identify possible dormant comets in the NEO population. With this project we would also like to corroborate the importance of Jupiter-family comets as a source of NEOs [1,2], meteoroid streams [6], or even meteorites [9]. Our

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main aim is detecting possible cometary candidates amongst the NEO population, also identifying new complexes of bodies produced during catastrophic disruption of their progenitors [6]. Such objects should be spectroscopically characterized by using larger instruments later on.

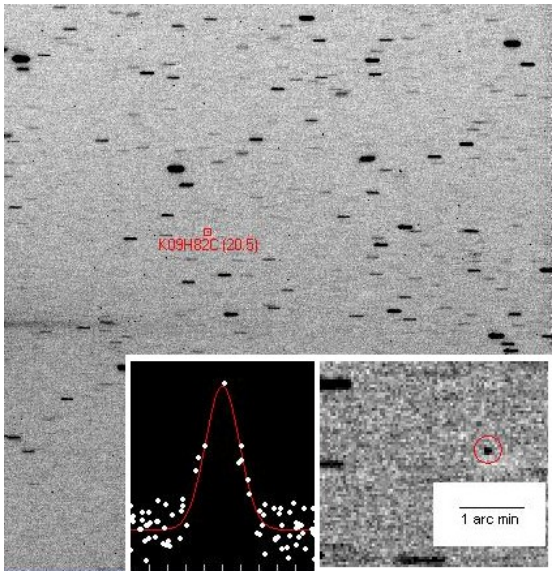

Figure 1: Composite of 12 images of 1 minute of exposure of 2009 H82C obtained on May 14.96, 2009 from La Cañada Observatory (J87). The field surrounding the object appears magnified in the lower right corner, together with the stellar-like FWHM curve.

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