Observation of Near Earth Asteroids (NEA) at the Abastumn Astrophysical Observatory

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Abstract

In this paper, the objects of study are near-Earth asteroids, or NEA for short. They are small solid celestial bodies that closely approach or intersect the Earth's orbit. From a scientific point of view, NEA approaches to the Earth allow us to study cosmic bodies. On the other hand, the importance of studying NEA is justified by the danger of these bodies falling to the Earth and causing catastrophic events. The fall of NEAs to the Earth's surface is a proven fact. Such events occurred in the past history of the Earth, are occurring at present and are expected in the future. Therefore, in order to predict such falls and understand the degree of danger, it is necessary to discover new NEAs and study them. Regular photometric observations of NEAs are carried out at the Abastumani Observatory, which are primarily the observatory's contribution to solving the global problem of "Asteroid Hazard". The study of asteroids in Abastumani will be continued by conducting their optical observations in selected areas of research.

Keywords: *asteroids, photometry, astrometry*

1. Introduction

In this paper, the objects of study are asteroids approaching the Earth, or NEA for short. They are small solid celestial bodies that come close to Earth's orbit or cross it. From a scientific point of view, NEA approaches to the Earth allow us to study space bodies. On the other hand, the importance of studying NEAs is justified by the danger of these bodies falling to the Earth and causing catastrophic events. The fall of NEAs on the Earth's surface is a proven fact. Such events have occurred in the past history of the Earth, are occurring now, and are expected in the future. Therefore, in order to predict such falls and understand the degree of danger, it is necessary to discover new NEAs and study them. In AbAO, regular CCD observations of near-Earth asteroids (NEAs) have been conducted since November 2012 under the leadership of Ragul Inasaridze. In close cooperation with the Abastumani and Kharkov observatories with the participation of the International Scientific Optical Network (ISON) and the European Space Agency (GAIA).

2. 70-cm Meniscus telescope and scientific results

Asteroid observations are conducted with the 70-cm Meniscus telescope [Fig. 1].

A modern IMG 4240 CCD camera with a CCD camera from an American company and an FLI CFW filter combination (B, V, R, I) installed in the Newtonian focus of the telescope is used; the field of view is 45 x 45 arc minutes. Observations are aimed at obtaining light curves of asteroids and cover long time intervals. Asteroids are observed for several hours during the night and most often for several nights. Photometry is done in integral light (without a filter and with filters). The exposure time for one picture is usually several minutes.

The light curves obtained from photometric observations allow us to determine the rotation periods and estimate the elongation of the asteroids. Analysis of a large set of light curves obtained from different

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Figure 1. 70-cm Meniscus telescope

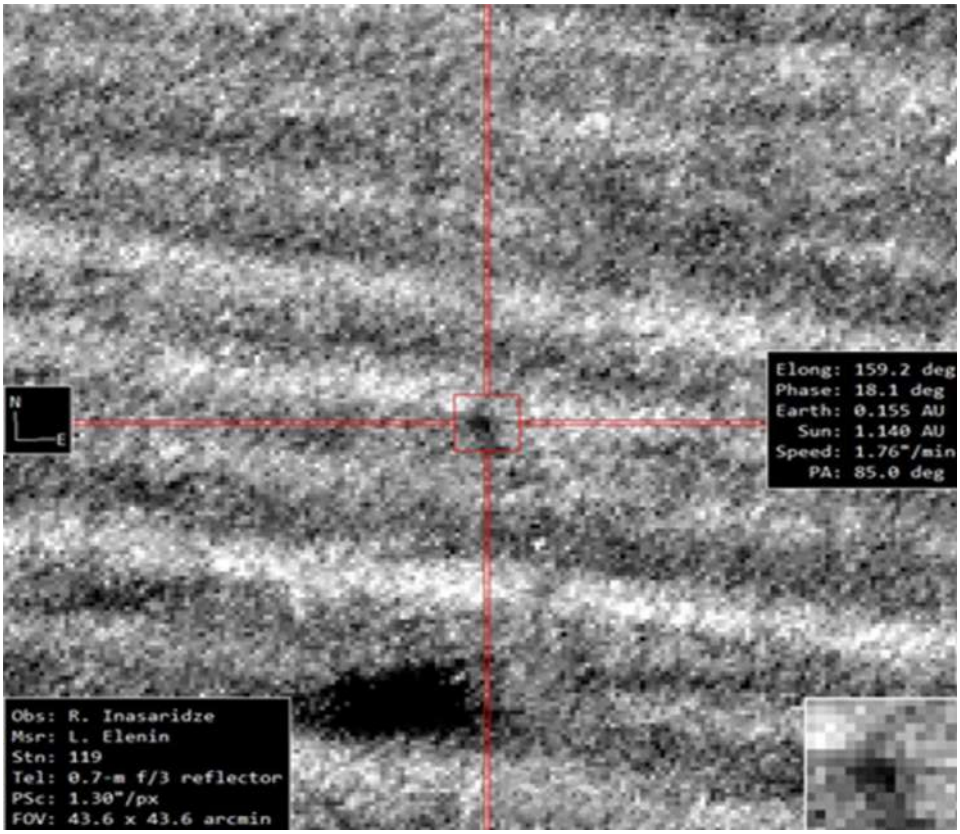

Figure 2. New asteroid was discovered on the night of October 26, 2021

Figure 3. DART spacecraft

aspects of observations makes it possible to construct a model of the asteroid body shape and determine the position of its rotation axis. This is usually achieved by observing the asteroid during several of its appearances near Earth. Among the objects of observation: Potentially hazardous and newly discovered NEAs, binary asteroids, asteroids with the detected influence of the YORP (Yarkovsky-O'Keeffe-Radzievskii-Paddack) effect on their rotation period.It is worth noting that under the leadership of Ragul Inasaridze. During this time, the following results were obtained:

- A new asteroid was discovered on the night of October 26, 2021. The new asteroid was confirmed by the International Minor Planet Astronomy Center (Smithsonian Astrophysical Observatory, Cambridge, MA 02138, USA) and assigned the number 2021 UL17. (see Fig. 2).
- Observations were made before and after the collision of the DART spacecraft with Dimorphos on September 26, 2022. (see Fig. 3).
- On 22 June 2023, the International Council of Astronomers assigned the name Ragul Inasaridze to Asteroid 32481 (32481Inasaridze). The asteroid was discovered on September 30, 2000 in the United States by the LONEOS (Lowell Observatory Near-Earth-Object Search) Lowell Observatory Search for Near-Earth Objects.

It should also be noted that in 2014-2017 and 2019-2021, the group received a grant from the Shota Rustaveli National Science Foundation, which was implemented successfully both times.

The Abastumani Observatory regularly conducts photometric observations of NEAs, which are primarily the observatory's contribution to solving the global problem of "Asteroid Hazard". The study of asteroids in Abastumani will continue by conducting their optical observations in selected areas of research.

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