ROTATIONAL PERIOD OF NEAR-EARTH ASTEROID (410088) 2007 EJ. D. F. Dina, [1]University of North Dakota, Space Studies Department, Clifford Hall Room 512, 4149 University Ave Stop 9008, Grand Forks, ND, 58202, devi.dina@und.edu.

Introduction: In the past several decades, asteroids have played an important role in revealing our understanding of the origin of the solar system. Asteroids are believed to be remnants of solar system formation 4.6 billion years ago. These swarms of rock never grew huge enough to form a single planet. Further, it is necessary to monitor the movement of NEAs due to its possibility of colliding with Earth. Past impact collisions such as Tunguska in 1908 and Chelyabinsk in 2013 have prompted both private and public institutions to recognize NEAs as a possible threat to life on Earth [1, 2].

Continuously observing NEOs has been accomplished through the ground and space-based observations. NASA assigned an ambition to discover 90% of the NEAs larger than 1 km in diameter in 1998. There are approximately 1000 NEAs larger than 1 km have been found. The Congress extended the program in 2005 to include 90% of the NEAs larger than 140 m [3]. For example, NASA supported ground-based telescopic surveys such as the Catalina Sky Survey (CSS) and the Lincoln Near-Earth Asteroid Research (LINEAR) Program. These surveys found the majority of NEO discoveries, especially in 1990s, as a response to collisional detection between Comet Shoemaker-Levy 9 and Jupiter [4, 5]. In addition, NASA has funded the Wide-Field Infrared Survey Explorer (WISE) in 2010, a space-based telescope survey, to allow detection of small bodies including NEOs on the mission called NEOWISE [6]. After more than 200 years since the discovery of (1) Ceres, asteroid survey efforts have been resulting in the discovery of numerous asteroids. Based on NASA Center for Near Earth Object Studies (CNEOS) report, as of January 4, 2019, approximately ~789,069 small bodies have been discovered.

Observations: For this study, asteroid photometric images were collected using 0.6-meter PROMPT 3 telescope located on the Cerro Tololo Inter-American Observatory in La Serena, Chile. The PROMPT 3 telescope is parts of the Skynet Robotic Telescope Network. This telescope is completely controlled with an automation system.

Image acquisition was made with an Apogee Alta F47 attached to the f/6.6 focus, resulting in a pixel scale of 0.668 arcsec/pixel in the 21 x 21 arcminutes FOV. Clear filter was used during the observation to increase the value of SNR. The exposure time was typically 30 seconds within 2 hours observation each night.

Methods: The analysis and photometric reduction were conducted using MPO Canopus program. The images were dark and flat subtracted using AstroImageJ (AIJ) software to reduce the noise from electronic such as read-out noise.

All collected asteroid data were being analyzed with

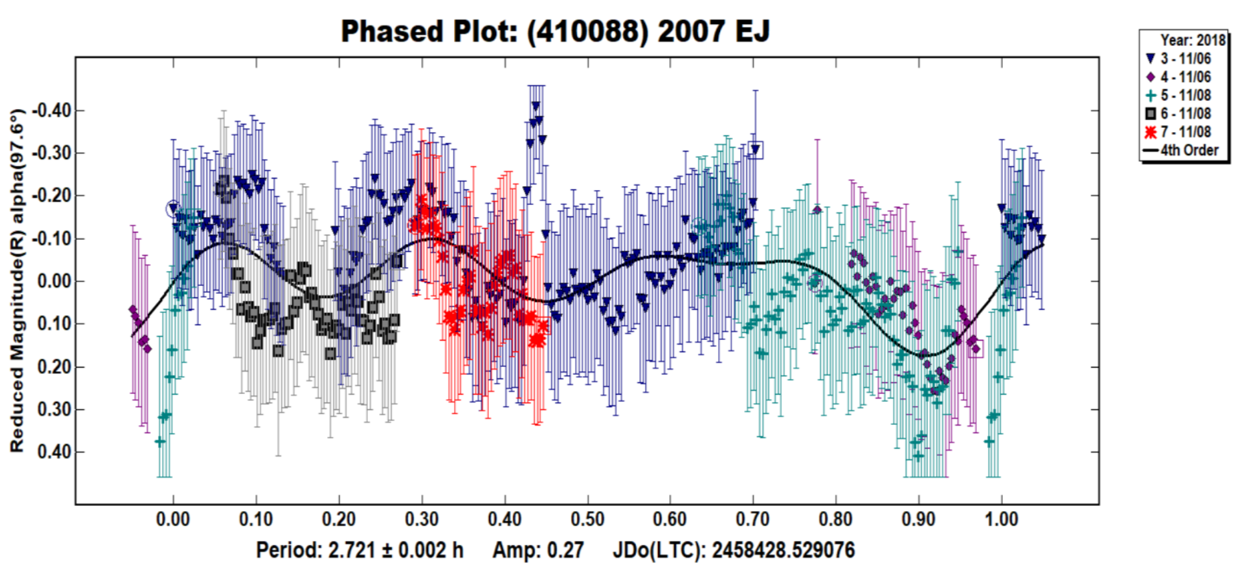

Figure 1: Lightcurve of (410088) 2007 EJ

Fourier transform analysis. The solution is resulting the magnitude for each individual lightcurve, the rotation period, Fourier coefficients, and estimated error for each observation [7]. Based on this solution, a lightcurve of mean reduced magnitude versus solar phase angle can be determined. The Fourier solution is based on Alan Harris work in 1989. The form of light variation of an asteroid is

$$H(\alpha, t) = \bar{H}(\alpha) + \sum_{l=i}^{m} X_i \sin\frac{2\pi L}{P}(t - t_0) + Y_i \cos\frac{2\pi L}{P}(t - t_0), \quad (1)$$

Where $H(\alpha, t)$ is the reduced magnitude at phase angle α and time t, $\bar{H}(\alpha)$ is the mean absolute magnitude at phase angle α, X_i, and Y_i are Fourier coefficients, P is the rotation period, and t_0 is a zero-point time [7].

Preliminary result: The final period P = 2.721 ± 0.002 h with an amplitude A = 0.27 mag was obtained from a fourth-order Fourier fit using MPO Canopus program (Fig 1). Rotation period for (410088) 2007 has been previously reported of the observed NEA. Our results will be compared to the published values.

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