Morphology and rotation period of comet C/2022 E3 (ZTF) Y. Moulane[1], D. Bodewits[1], S. Hmiddouch[2], M. Vander Donckt[2], T. Lister[3], E. Jehin[2], [1]Physics Department, Edmund C. Leach Science Center, Auburn University, AL 36832, USA (ymoulane@auburn.edu), [2]Space sciences, Technologies & Astrophysics Research (STAR) Institute, University of Liège, Belgium. [3]Las Cumbres Observatory, 6740 Cortona Drive, Suite 102, Goleta, CA 93117, USA

We report on the gas coma morphology and rotation period of comet C/2022 E3 (ZTF) that was discovered by the Zwicky Transient Facility (ZTF) on March 2, 2022. This comet reached its perihelion on January 12, 2023, at a distance of 1.11 AU from the Sun, and made its closest approach to Earth on February 1st, 2023 at a distance of 0.28 AU. To obtain comprehensive coverage of the comet's possible rotation rates, we utilized multiple ground-based telescopes situated in the northern and southern hemispheres due to the comet's proximity and brightness, allowing for high-cadence temporal observations.

The study of coma morphology can provide us with information about the rotation period, active areas, and homogeneity of the nucleus [4,5]. Cyanogen (CN) has been used extensively to measure the rotation of comet nuclei and our campaign was focussed on the B-X feature of CN around 387 nm. For this, we used the Spectral camera[1] mounted on the 2-m LCO telescope in Australia, which is equipped with narrow-band filters that coincidentally include this feature skymapper and D5 We used comet-specific HB narrow-band filters [1] and broad-band filters equipped with TRAPPIST-N in Morocco and TRAPPIST-S in Chile [2]. Additionally, we used the broad-band BVRI filters equipped with a 2.1-m telescope[2] at the McDonald Observatory in Texas.

Our observations were carried out between February 11th and 15th, 2023. We applied the Division by Azimuthal Average enhancement technique [3] on the narrow-band images to investigate the morphology and structures of the comet's coma. In addition, we used BVRI broad-band filters to perform aperture photometry and obtain the lightcurves of the comet. Our narrow-band images revealed a consistently, prominent morphological structure in the inner coma, consisting of two side-on jets with central axes aligned approximately north-south. This strong activity originates from at least two large areas on the cometary nucleus and modulated by rotation. This morphology was observed in different images acquired one to four nights apart, indicating the persistence of the feature. Figure 1 presents an enhanced skymapper image obtained with a 2-m LCO telescope on Feb. 14, 2023, which illustrates the comet's morphology.

Our presentation will cover our findings related to various characteristics of the nucleus, such as its rotation period determined using both morphology and light-curves, obliquity, approximate locations of active areas, and more.

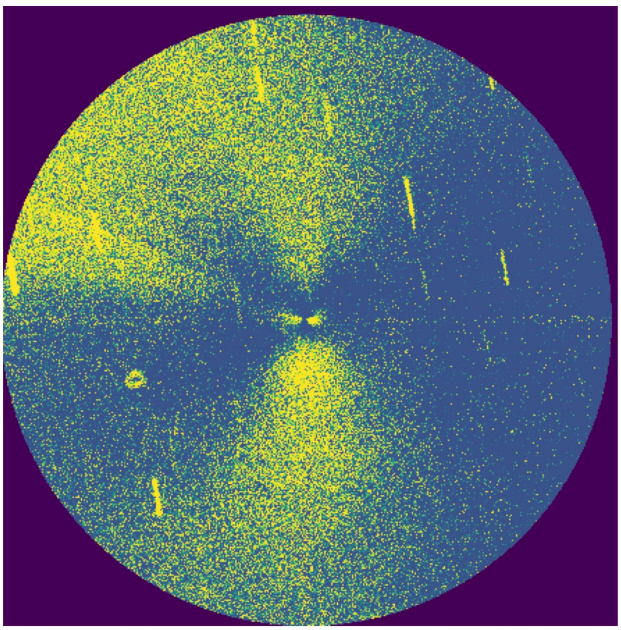

Figure 1: Skymapper/LCO image enhanced showing two jets detected in the coma of comet C/2022 E3 (ZTF).

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