PRE-PERIHELION PHOTOMETRIC FOLLOW-UP OF LONG PERIOD COMET 2022 E3 (ZTF): WEAKING UP FROM THE DARK. A. Sánchez[1], J.M. Trigo-Rodríguez[2,3], and J.M. Llenas[4]. [1]Gualba Observatory (MPC 442), Barcelona, Catalonia, Spain, [2]Institute of Space Sciences (CSIC), Campus UAB, Carrer de Can Magrans s/n, 08193 Cerdanyola del Vallés (Barcelona), Catalonia, Spain. trigo@ice.csic.es [3]Institut d'Estudis Espacials de Catalunya (IEEC), Ed. Nexus, Barcelona, Catalonia, Spain, [4]Observatori de Pujalt, Pujalt, Barcelona, Catalonia, Spain.

Introduction: Comet 2022 E3 was discovered using the wide-field survey camera at the Zwicky Transient Facility (ZTF) last year. It is a long-period comet with potential to be a naked-eye objects during the end of January and beginning of February 2022. We have being observing this comet that exhibits a broad fan-like dust tail, and long plasma tail stretching across a few degrees at the time of our last observations. Our observations are consistent with a naked-eye visibility, probably around +5 V magnitude in Feb. 2023.

We are particularly interested in long-period comets because they come from very distant afelia, and they have a big potential to exhibit strong outgassing, or even outburst-like activity [2]. In that sense, our previous work monitoring outbursts in comets [3-4] gives us know-how to keep studying these objects. Photometric results are of key interest to understand the subtile photometric variations, and the possible short-term outcome of tiny changes found first in the false nucleus, the closer region to the cometary core. Our telescopes have limited resolution to study the processes ongoing, but we can still learn a lot using multiband photometry [4]. Massive outgassing releases large aggregates, often cm-sized that are splitting into smaller micron-sized particles in question of hours. Such a massive injection of fresh micron-sized dust has significant influence in the scattering of sunlight.

C/2022 E3 will reach its perihelion on January 12, 2023, at a distance of 1.11 au, and its closest approach to our planet will be on February 1, 2023 when it will be at 0.28 au from us. The remnant activity of long period comets when passing again close to the Sun is always a mistery, and many times depends on their previous incoming voyages through the inner Solar System. Our telescopic pre-perihelion observations of this comet demonstrate a very significant sublimation of ices, particularly at the heliocentric distance in which we expect significant sublimation of ices. All these outgassing participates in a very promising production of micron-sized dust that has participated in increasing the comet overall magnitude in the last couple of weeks before reaching its perihelion.

Technical procedure: We are conducting a monitoring program of ground-based photometry by using standard Johnson-Cousin filters. We have been monitoring this object on different nights from four observatories (see Table 1). Our photometric coverage for simplicity has been focused in standard measurements in V, R, and I filters. Here we concentrate in R magnitude measurements. Photometry is standardized as in our previous work to an aperture of 10 arcsec [3-4].

To notice small changes in the release of dust we usually use a standard 10-arcsec aperture photometry centered in the false nucleus. It allows us to study the R magnitude evolution over time, and compare it with the appearance and jet activity. We used the USNO 2.0 catalog to get star magnitudes so an accuracy of about 0.05 magnitudes is reasonable.

Observatory (MPC code)	Instrument
Gualba, Barcelona (442)	SC 36.0 f/7
Montseny (B06)	T 20 f/6
Observatori de Pujalt (M04)	CDK 51 f/6.8

Table 1. Observatories involved in this follow-up.

Results and discussion: The pre-perihelion photometric evolution of C/20022 E3 shows a very active nucleus that is quickly increasing its magnitude (Fig. 1). The false nucleus is often exhibiting several jets exemplifying increasing activity since the end of December, 2022. More or less at the same time the comet ion tail has developed significantly (Fig. 2).

We noticed a monotonic increase in the "R" magnitude of the comet in the 2 weeks period in which the comet started to be well placed for the Northern Hemisphere. Now, during its approach to the Sun, at the time it decreases its distance to Earth, the comet magnitude will increase to make it a naked-eye object.

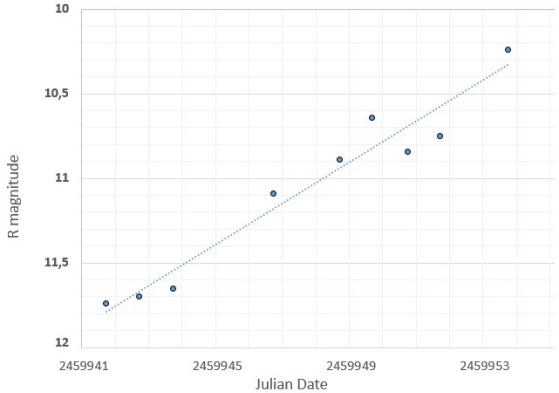

Figure 1. C/2022 E3 R-band photometry for a 10 arcsec standardized aperture.

Conclusions: We present here preliminary photometric results of long-period comet C/2022 E3. A monotonic continuous increase in its R magnitude is found, suggesting this comet will become a +5 V magnitude object during the first week of February, 2023, in coincidence with its maximum approach to Earth. No sudden magnitude increase associated with outbursts has been noticed so far, but we will keep our monitoring to keep learning about this comet, just while it is briefly weaking up from the dark.

References: [1] Jewitt D. (2008) In *Trans-Neptunian Objects and Comets*. K. Altwegg et al. (eds.)., Springer-Verlag, Berlin, pp. 1-78. [2] D. Prialnik (2005) In *Comets II*, Univ. Az. Press, Tucson, 359-387. [3] Trigo-Rodríguez J.M. et al. (2009) Outburst activity in comets: I. Continuous monitoring of comet 29P/SW1. *Astron. & Astroph.* 485, 599-606. [4] Trigo-Rodríguez J.M. et al. (2010) Outburst activity in comets: II. A multiband photometric monitoring of comet 29P/SW1. *Mon. Not. Roy. Ast. Soc.* 409, 1682-1690.

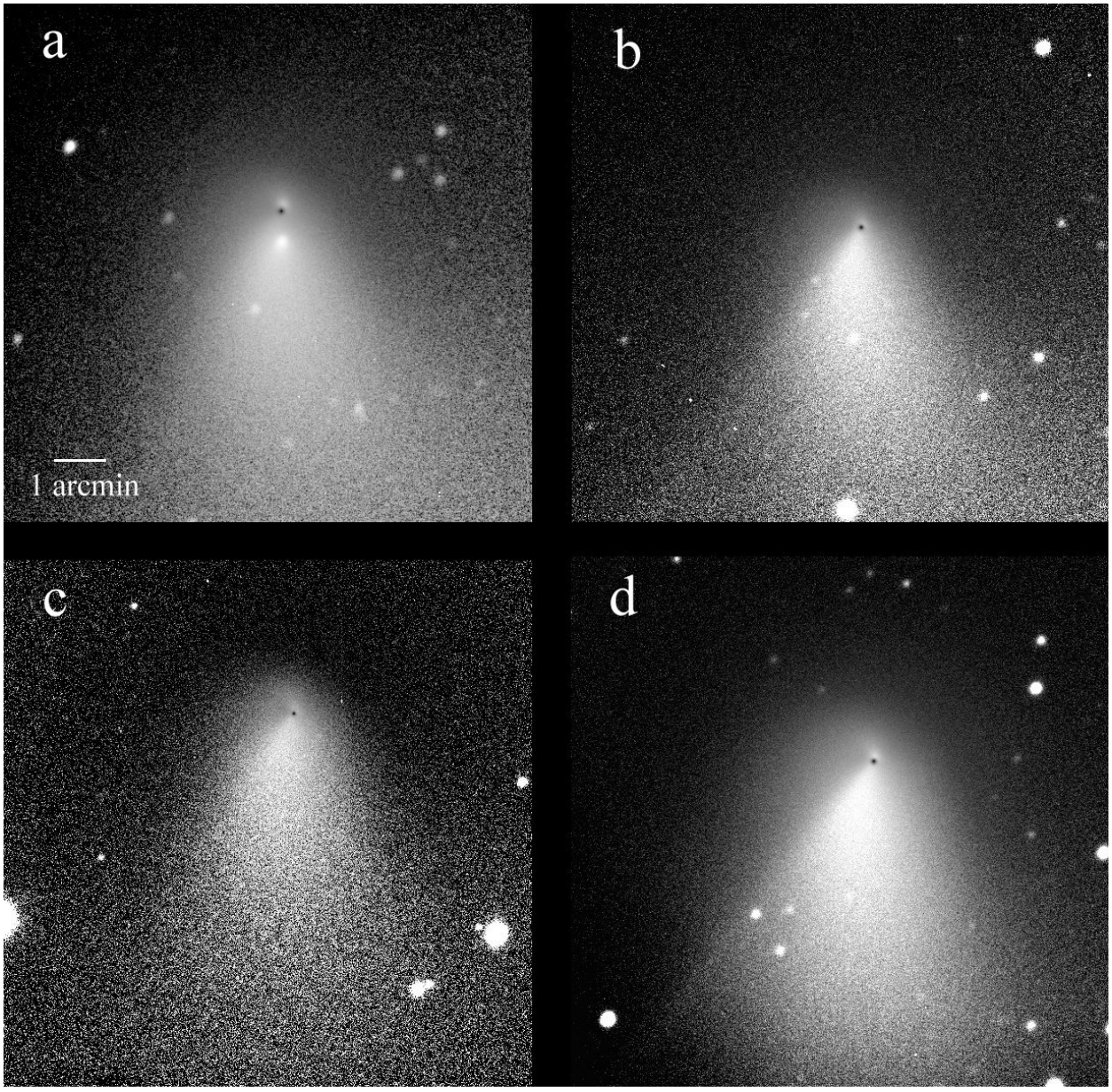

Figure 2. Consecutive images obtained from MPC442 to exemplify the evolution in the appearance of C/2022 E3 inner comma. The ion tail increases its intensity over time. A one arcmin scale in first image is identical for all images taken respectively on: a) Dec. 27, 2022; b) Dec. 28, 2022; c) Gen. 4, 2023, and d) Jan. 5, 2023.