PHOTOMETRIC MONITORING OF A 29P/SCHWASSMANN-WACHMANN 1 OUTBURST IN NOVEMBER 2020. A. Sánchez[1], J.M. Trigo-Rodríguez[2], and D. Rodríguez[3], [1]Gualba Observatory, Barcelona, Catalonia, Spain, [2]Institute of Space Sciences (IEEC-CSIC), Campus UAB, Carrer de Can Magrans s/n, 08193 Cerdanyola del Vallés (Barcelona), Catalonia, Spain. trigo@ice.csic.es [3]Guadarrama Observatory, Madrid, Spain.

Introduction: The scientific interest about comet 29P/Schwassmann-Wachmann 1 (hereafter SW1) is enormous. It has been observed to display very significant activity during about a century and it is the prototype of comets exhibiting bright outbursts [1]. In addition, this object is a great candidate for a future space mission, and we demonstrated that long-term dedicated monitoring of its activity can be very useful to understand the physical processes at work in active comets [2-3]. The contrast between outbursting events and quiescent outgassing activity is notorious and allow us to get a very interesting notion about the physical processes taking place in a moderately distant comet.

Our research team continues the follow up of SW1 using medium-sized telescopes (Table 1). A continuous photometric monitoring is an excellent method as this object exhibits abrupts changes in its coma appearance and brightness. After more than a decade of continuous photometric monitoring, our team wish to promote further studies to better understand the physico-chemical processes that are triggering its outbursts. The inferred pristine nature could make successful any future exploration mission to this Centaur.

Technical procedure: We have continued during 2020 our follow-up of Centaur SW1 from different observatories listed in Table 1. By performing multiband photometry in different Johnson-Kron-Cousin standard filters for a standardized 10-arcsec aperture we are able to notice subtle changes in SW1 activity. Images in each filter are calibrated using standard stars given by the Landolt and Stetson calibration fields, in a similar way as was implemented in our recent paper on the 2008-2010 SW1 monitoring [3]

Observatory (MPC code)	Instrument
Gualba, Barcelona (442)	SC 36.0 f/7
Guadarrama, Madrid (458)	SC 25 f/10
Montseny, Girona (B06)	C 25.0 f/10

Table 1. Main observatories involved in SW1 follow up.

Results and discussion: After a long quiescent period, SW1 experienced a 2.7 magnitudes outburst [4] on Nov. 20, 2020 (Fig. 2). Our accurate photometric data confirms such a magnitude increment in the R photometric band (Fig. 1). A continuous follow-up of the photometric variations allows assessing the amount of dust released from the nucleus corresponding with an AfRho=8500±400 cm. It also helps to understand the role of solar activity in triggering cometary outbursts. In fact, the active Sun has produced significant flares that so far have not affected the activity of this comet. In any case, we plan to keep our standardized photometry for a 10 arc-sec nuclei-centered surface. V, R, and I filters of the Johnson-Kron-Cousins system are used, and accurately calibrated using standard Landolt stars [2-3]. As we proposed previously in [2], the origin of such outbursts is a massive release of large (optically-thin) particles from the surface at the time of the outburst. That is the triggering mechanism to produce the magnitude increase because every outburst is announced by an early increase in the I magnitude. It seems that the sublimation of such ice-rich particles during the following days induces fragmentation, generating micrometer-sized grains that increase the dust spatial density to produce the outburst in the optical range due to scattering of sun light. When a massive ejection of dust takes place, the dust leaving the nucleus adopts a fan-like shape, formed by micrometer-sized particles, that is decaying in brightness as it evolved outwards.

Conclusions: Cometary outbursts experienced by SW1 are dominated by the explosive release of comet grains from active regions in its nucleus and their later disintegration in the coma [3]. The 2-3 days decay of particles into µm-sized dust is probably driven by CO sublimation [5] and suggests that SW1 is a pristine comet, composed by fine-grained materials collected by Stardust mission from 81P/Wild 2 [6]. Additional studies of the magnitude increase and decay, plus spectroscopic observations could provide additional insight into the sublimation processes. As a by-product of SW1 monitoring we plan to predict future outbursts in order to have enough time to perform accurate spectroscopy with larger instruments.

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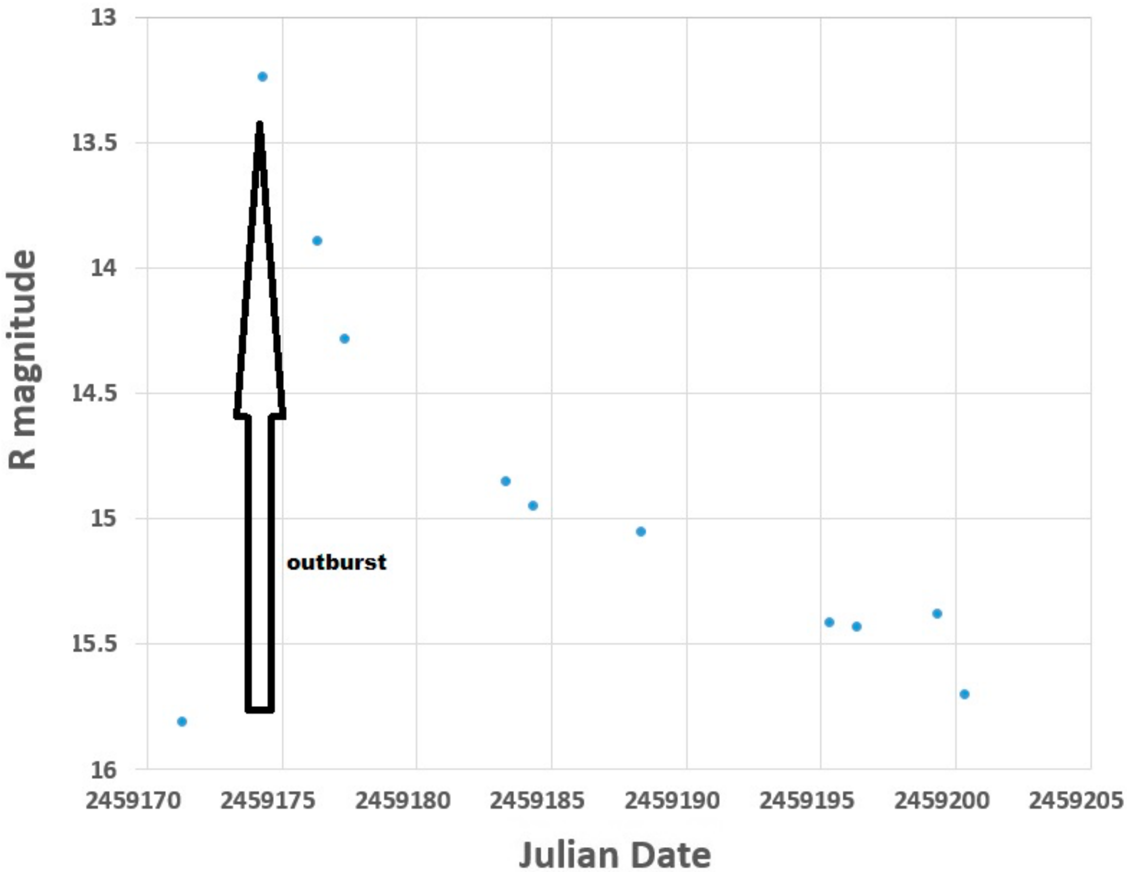

Figure 1. Photometry of SW1 during November-december 2020

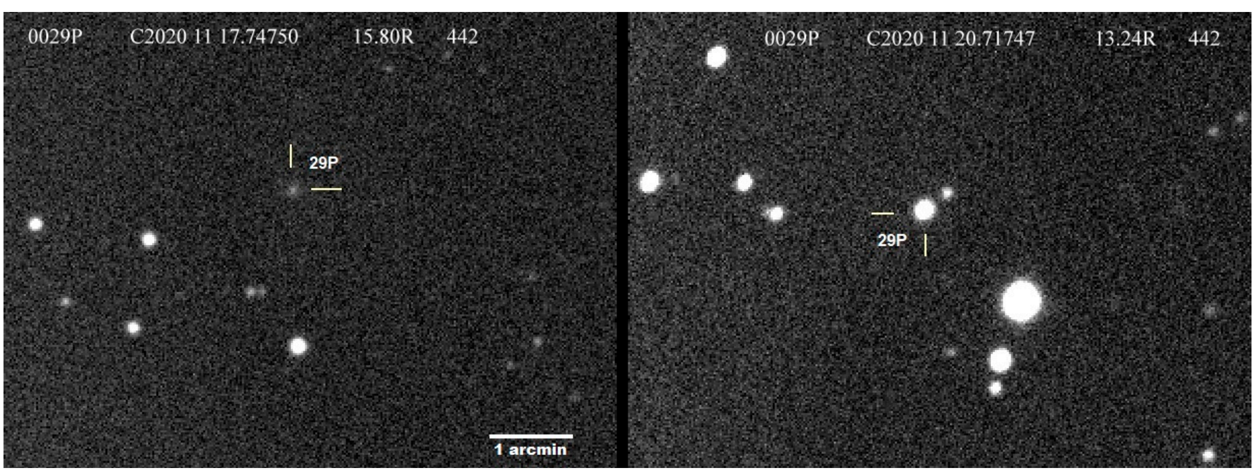

Figure 2. Consecutive images of the change in appearance of comet 29P/ Schwassmann-Wachmann 1 as consequence of the outburst experienced on Nov. 19th, 2020.