

Large outburst of comet 73P/Schwassmann-Wachmann 3

ATel #15673; [E. Jehin, M. Vander Donckt, J. Manfroid, and Y. Moulane \(STAR Institute, University of Liege\)](#)
on 13 Oct 2022; 00:05 UT

Credential Certification: Emmanuel Jehin (ejehin@uliege.be)

Subjects: Optical, Comet

We report about a large outburst of the Jupiter family-comet 73P/SW-3 that happened between September 30 and October 5 UT 2022, about 40 days after its perihelion. Observations were carried on during our regular comet activity monitoring with the TRAPPIST-South (code=I40, Chile) robotic telescope (Jehin et al. 2011) on both nights around 00:15 UT using broad band and cometary HB narrowband filters (Farnham et al. 2000). The gas production rates were computed at 10.000 km using a Haser Model ($V_p=V_d=1\text{km/s}$) (Haser 1957) and the dust production rates proxy $A(0)f(\rho)$ were estimated by profile fitting at 10.000 km (A'Hearn et al. 1984) and corrected for the phase angle (Schleicher 2007).

While the magnitudes and the gas production rates were found very similar on several dates in September, there was a huge increase of 4.5 magnitudes in R band, measured in an aperture of 5" centred on the nucleus, on the images obtained on Oct. 5, at 00:15 UT ($R=11.2\pm 0.1$) compared to those of Sept. 30 ($R=15.6\pm 0.1$). The production rates of the gaseous species were all multiplied by a very large factor of about 60 with respect to those measured on Sept 30. The $A(0)f_p$ parameter increased also by the same factor. All these values had decreased by a factor of about 3 on September 11, one week later. The CN coma was found very elongated and a double jet feature along the North-south direction is visible after a rotational gradient is applied.

We conclude that a large outburst of this well-known carbon-chain poor and split comet, occurred between Sep 30, 00:15 UT and October 5, 00:15 UT, reaching on that date, a high value of $Q(\text{OH})$ of $5.45 \text{ E}28 \text{ molec/s}$. The comet activity dropped but the production rates are still high for this comet which is a good candidate for spectroscopic observations. New fragments might have been released during this event and could show up in a near future. The measurements of the closest nights before, during and after the outburst are reported below.

73P/Schwassmann-Wachmann 3

Date UT=2022-09-30, $r_h=1.09 \text{ au}$, $\Delta=0.97 \text{ au}$, $DT=+35 \text{ days}$

$Q(\text{OH})=8.84\pm 2.52 \text{ E}26 \text{ s}^{-1}$

$Q(\text{CN})=3.34\pm 0.32 \text{ E}24 \text{ s}^{-1}$

$Q(\text{C}_2)=4.27\pm 2.53 \text{ E}23 \text{ s}^{-1}$ (large error)

$A(0)f_p(R)=68\pm 9 \text{ cm}$

73P/Schwassmann-Wachmann 3

Date UT=2022-10-05, $r_h=1.13 \text{ au}$, $\Delta=0.99 \text{ au}$, $DT=+40 \text{ days}$

$Q(\text{OH})=5.45\pm 0.92 \text{ E}28 \text{ s}^{-1}$

$Q(\text{CN})=1.99\pm 0.17 \text{ E}26 \text{ s}^{-1}$

$Q(C2)=4.87\pm 0.50 \text{ E}25 \text{ s}^{-1}$
 $A(0)_{fp}(R)=4180\pm 70 \text{ cm}$

73P/Schwassmann-Wachmann 3

Date UT=2022-10-11, $r_h=1.17 \text{ au}$, $\Delta=1.01 \text{ au}$, $DT=+46 \text{ days}$

$Q(OH)=1.84\pm 0.33 \text{ E}28 \text{ s}^{-1}$

$Q(CN)=7.13\pm 0.64 \text{ E}25 \text{ s}^{-1}$

$Q(C2)=1.62\pm 0.26 \text{ E}25 \text{ s}^{-1}$

$A(0)_{fp}(R)=1522\pm 373 \text{ cm}$

Notations: r_h = heliocentric distance (in au), Δ =geocentric distance (in au), DT = Time to perihelion. OH, NH, C3, CN, C2 are the HB gaseous narrowband filters for the corresponding species, and BC, GC, RC are the blue, green and red dust continuum filters (Farnham et al. 2000)

Acknowledgments: TRAPPIST is a project funded by the Belgian F.R.S.-FNRS under grant PDR T.0120.21. Observations were carried on from the ESO La Silla Paranal and Oukaimeden Observatory. We thank NASA, David Schleicher and the Lowell Observatory for the loan of the HB comet filters. <https://www.trappist.uliege.be/>
