TRAPPIST bright comets production rates: 3I/ATLAS, 24P/Schaumasse, C/2025 T1 (ATLAS), C/2025 K1 (ATLAS) and C/2025 R2 (SWAN)

ATel #17538; ***E. Jehin, S. Hmiddouch, K. Aravind, J. Manfroid (STAR Institute, University of Liege), Z. Benkhaldoun, and A. Jabiri (Cadi Ayyad University of Marrakech).***
on ***10 Dec 2025; 22:50 UT***
Credential Certification: Emmanuel Jehin (ejehin@uliege.be)

Subjects: Optical, Comet

The author report that they obtained, using the TRAPPIST-North (Z53) robotic telescope, recent observations of the following bright comets including 3I/ATLAS. They used broadband filters and cometary HB narrowband (gas and dust) continuum filters (Farnham et al. 2000, Jehin et al. 2011) and computed preliminary production rates from extracted profiles at 10.000 km using a Haser Model (Vp=Vd=1km/s) (Haser 1957). Zero Points were computed on the three nights using standard stars. The proxy to the dust production rates 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).

3I/ATLAS

Date UT=2025-12-07, r_h= 1.98 au, Delta= 1.84 au, DT=+40 days
Q(OH) = 6.93 +/- 1.13 E27 s-1
Q(NH) = 5.03 +/- 1.98 E25 s-1
Q(CN) = 3.64 +/- 0.24 E25 s-1
Q(C2) = 4.15 +/- 0.44 E25 s-1
Q(C3) = 5.33 +/- 1.21 E24 s-1
A(0)fp(RC) = 4012.73 +/- 43.99 cm
A(0)fp(BC) = 2500.10 +/- 58.35 cm
A(0)fp(R) = 3509.4 +/- 53.71 cm

The production rates of the interstellar coemt have dropped by more than 50% in 10 days (see TRAPPIST ATel #17515). With Log Q(C2/CN)= +0.06 the comet has now a typical composition.

24P/Schaumasse

Date UT=2025-11-28, r_h= 1.3 au, Delta= 0.7 au, DT=-39 days
Q(OH) = 1.59 +/- 0.63 E27 s-1
Q(CN) = 4.46 +/- 0.29 E24 s-1
Q(C2) = 5.80 +/- 0.47 E24 s-1
A(0)fp(RC) = 72.15 +/- 14.11 cm
A(0)fp(BC) = 44.84 +/- 15.22 cm

A(0)fp(R)= 78.04 +/- 10.60 cm

One month from perihelion OH, CN and C2 are well detected in this Jupiter Family Comet. With a Log Q(C2/CN)= +0.11 ratio, the comet belongs to the typical group. The solar continuum is very faint with a low Afrho.

C/2025 T1 (ATLAS)
Date UT=2025-11-27, r_h= 1.11 au, Delta= 1.13 au, DT=-4 days
Q(OH) = 8.77 +/- 1.58 E27 s-1
Q(CN) = 5.95 +/- 0.24 E25 s-1
Q(C2) = 7.70 +/- 0.24 E25 s-1
A(0)fp(RC) = 518.78 +/- 13.22 cm
A(0)fp(BC) = 400.55 +/- 30.97 cm

Low on the horizon in the evening sky, the dynamically new comet is now at perihelion at 1.1 au. It is C2 rich and dust poor.

C/2025 K1 (ATLAS)
Date UT=2025-11-27, r_h= 1.24 au, Delta= 0.41 au, DT=+50 days
Q(OH) = 5.99 +/- 0.94 E27 s-1
Q(NH) = 2.15 +/- 0.73 E25 s-1
Q(CN): no gas detection within error
Q(C2): no gas detection within error
Q(C3): no gas detection within error
A(0)fp(RC) = 263.58 +/- 9.19 cm
A(0)fp(BC) = 270.98 +/- 10.91 cm

Fragmented comet (ATel #17487) that has a very peculiar composition dominated by NH2 emissions (ATel #17500, #17518). The CN, C2 and C3 emissions are not detected after the dust subtraction confirming its peculiar composition. Images obtained from Nov 26 to Dec 9 UT, are showing 3 main fragments embedded in an elongated dust coma with varying magnitudes night after night.

C/2025 R2 (SWAN)
Date UT=2025-11-27, r_h= 1.61 au, Delta= 0.90 au, DT=+77 days
Q(OH) = 7.52 +/- 2.92 E26 s-1
Q(CN) = 1.19 +/- 0.07 E25 s-1
Q(C2) = 1.41 +/- 0.10 E25 s-1
Q(C3) = 3.09 +/- 0.64 E24 s-1
A(0)fp(RC) = 181.56 +/- 3.17 cm
A(0)fp(BC) = 130.99 +/- 3.85 cm

Notations: rh= heliocentric distance (in au), Delta=geocentric distance (in au), DT= Time to perihelion. OH, NH, C3, CN, and C2 are the HB gaseous narrowband filters for the corresponding species, and BC, GC, and 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/