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Observations of the 18-cm lines of the OH radical in comets with the Nançay radio telescope

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Since 1973, the 18-cm lines of the OH radical have been systematically observed in selected comets with the 300×40 m radio telescope at Nançay. Up to now, 133 comets have been observed (counting different returns of short-period comets as different comets), totalling about 6000 individual observations (typically one hour per day for each observation).

These observations trace the water production rates (through its photodissociation product OH) and the coma expansion velocity. They are precious for statistical investigations of the evolution of the activity of the comets.

These observations are also made as a participation to multi-wavelength observing campaigns of dedicated comets and as a support to cometary space missions.

The observations are organized in a database which is progressively made publicly available: http://www.lesia.obspm.fr/planeto/cometes/basecom/ [1]

The most recent observations are listed in Table 1. Here are some recent highlights:

103P/Hartley 2 was observed in support to its fly-by by the *EPOXI* mission and to observations with *Herschel*. [2]

The outbursts of the sungrazing comet C/2012 S1 (ISON), preceding its demise as it approached the Sun at 0.012 AU on 28 November 2013, were observed. [3]

Comet C/2013 A1 (Siding Spring) was detected just before it passed at only 0.001 AU from Mars on 19 October 2014, due to enhanced background radiation as the comet was close to the Galactic plane. [4]

The Nançay radio telescope actively participated to the multi-wavelength observing campaigns of the bright comets C/2011 L4 (PANSTARRS), C/2012 F6 (Lemmon), C/2012 X1 (LINEAR), C/2013 R1 (Lovejoy) and C/2014 Q2 (Lovejoy) (Fig. 1), especially in coordination with radio observations with IRAM and ALMA.

It should be noted that the *Rosetta* target 67P/Churyumov-Gerasimenko, which was marginally detected at its 1982 passage due to a relatively close approach to Earth ($\Delta = 0.39$ AU) [1], is unfavourably placed at its present return for observations at Nançay.

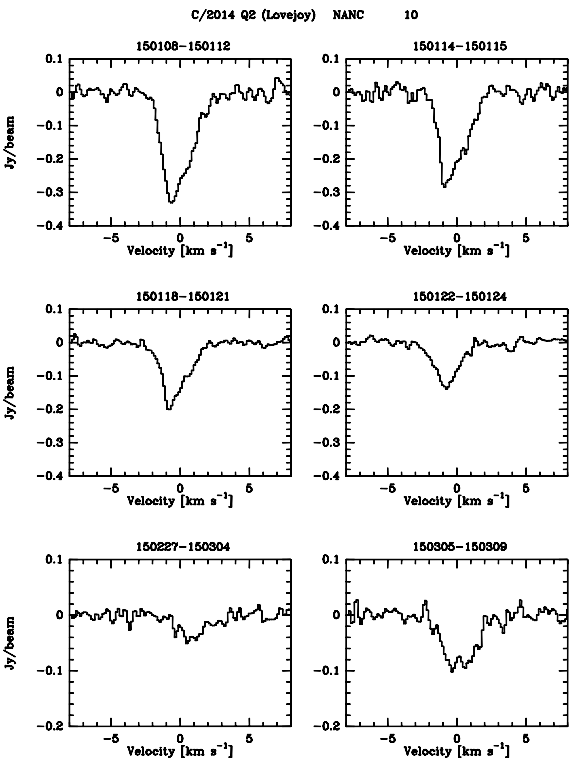

Figure 1: Sample spectra of C/2014 Q2 (Lovejoy) observed in January-March 2015.

References

[1] Crovisier, J., Colom, P., Gérard, E., Bockelée-Morvan, D., and Bourgois, G.: Observations at Nançay of the OH 18-cm lines in comets: The data base. Observations made

Table 1: Comets observed at Nançay since mid-2010.

comet	perihelion [yymmdd]	q [AU]	range of observations [yymmdd]	r_h range a) [AU]	N b)	c)	d)
C/2009 K5 (McNaught)	100430.03	1.422	100401–100414	1.44–1.48	7	L	D
C/2009 R1 (McNaught)	100702.16	0.401	100401–100831	0.41–1.92	60	L	D
10P/Tempel 2	100704.86	1.424	100422–100730	1.42–1.61	54	J	D
103P/Hartley 2	101028.50	1.058	100803–110131	1.06–1.63	113	J	D
C/2010 X1 (Elenin)	110910.74	0.482	110527–111023	0.48–2.09	54	L	D
45P/Honda-Mrkos-Pajdusakova	110928.78	0.530	110723–110916	0.59–1.34	21	J	D
C/2009 P1 (Garradd)	111224.03	1.550	110701–120330	1.57–2.75	117	L	D
96P/Machholz 1 (2012)	120714.78	0.124	120616–120811	0.14–0.88	26	H	M
C/2012 K5 (LINEAR)	121128.69	1.142	121220–131113	1.19–1.36	14	L	M
C/2011 F1 (LINEAR)	130108.04	1.118	121031–121221	1.83–2.01	23	L	D
C/2012 T5 (Bressi)	130224.17	0.323	130102–130214	0.43–1.29	29	L	–
C/2011 L4 (PANSTARRS)	130310.14	0.302	120901–130510	0.30–3.35	115	L	D
C/2012 F6 (Lemmon)	130324.52	0.731	130313–130428	0.76–1.00	18	L	D
C/2012 S1 (ISON)	131128.78	0.012	130708–131209	0.06–3.00	82	L	D
C/2013 R1 (Lovejoy)	131222.94	0.817	131101–140223	0.81–1.24	57	L	D
C/2012 X1 (LINEAR)	140221.64	1.599	131026–140508	1.62–2.22	54	L	D
C/2014 E2 (Jacques)	140702.50	0.665	140501–140919	0.67–1.77	64	L	D
C/2013 UQ4 (Catalina)	140706.00	1.081	140615–140630	1.09–1.13	5	H	–
C/2012 K1 (PANSTARRS)	140827.63	1.055	140403–140927	1.05–2.44	68	L	D
C/2013 V5 (Oukaimeden)	140928.17	0.627	140716–141024	0.63–1.55	40	L	D
C/2013 A1 (Siding Spring)	141025.39	1.399	141005–141220	1.43–1.61	22	L	D
C/2014 Q2 (Lovejoy)	150130.09	1.291	141221–150330	1.29–1.56	51	L	D

a) Lowest and highest heliocentric distance of the observations.
b) Number of observations in the data base.
c) L: long-period comet; H: Halley-family comet; J: Jupiter-family comet.
d) –: no detection; M: marginal detection; D: clear detection.

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[2] Crovisier, J., Colom, P., Biver, N., Bockelée-Morvan, D., and Boissier, J.: Observations of the OH 18-cm lines of Comet 103P/Hartley at Nançay in support to the EPOXI and Herschel missions. Icarus, 222, 679–683, 2013.

[3] Crovisier, J., Colom, P., Biver, N., and Bockelée-Morvan, D.: Comet C/2012 S1 (ISON). IAU Elect. Tel. No 3711, 2013.

[4] Crovisier, J., Colom, P., Biver, N., and Bockelée-Morvan, D.: Comet C/2013 A1 (Siding Spring). IAU Elect. Tel. No 4001, 2014.