

A molecular survey of comet C/2014 Q2 (Lovejoy) at radio wavelengths

N. Biver (1), R. Moreno (1), J. Boissier (2), D.C. Lis (3), D. Bockelée-Morvan (1), J. Crovisier (1), P. Colom (1), G. Paubert (4), S. Milam (5), Aa. Sandqvist (6), A. Hjalmarson (7), S. Lundin (8), T. Karlsson (8), M. Battelino (8), U. Frisk (9), D. Murtagh (10), L. Nordh (11) and the Odin team.

(1) LESIA, Observatoire de Paris, CNRS, UPMC, Université Paris-Diderot, 5 place Jules Janssen, F-92195 Meudon, France, (nicolas.biver@obspm.fr); (2) IRAM, 300, rue de la Piscine, F-38406 Saint Martin d'Hères, France; (3) LERMA, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universités, UPMC Univ. Paris 06, 61 av. de l'Observatoire, F-75014, Paris, France; (4) IRAM, Avd. Divina Pastora, 7, 18012 Granada, Spain; (5) NASA Goddard Space Flight Center, Astrochemistry Laboratory, Code 691.0, Washington, USA; (6) Stockholm Observatory, AlbaNova University Center, SE-106 91 Stockholm, Sweden; (7) Onsala Space Observatory, Chalmers University of Technology, SE-439 92 ONSALA, Sweden; (8) OHB Sweden, P.O. Box 1269, SE-164 29 Kista, Sweden; (9) Omnisys Instruments, August Barks Gata 6B, SE-421 32 Västra Frölunda, Sweden; (10) Dept. of Radio and Space Science, Chalmers Technical University, Gothenburg, Sweden; (11) Swedish National Space Board, Box 4006, SE-171 04 Solna, Sweden

Abstract

Comet C/2014 Q2 (Lovejoy) is a long period Oort Cloud comet (original orbital period = 11030 years, inclination = 80.3°) which passed perihelion at 1.290 AU from the Sun on 30 January 2015. It brightened very quickly as it approached the Sun and the Earth (perigee at 0.469 AU on 7 January 2015) to reach naked eye visibility ($m_1 = 4$) and a total production rate approaching $Q_{H_2O} = 10^{30}$ molec. s^{-1} .

This comet was intrinsically the most active comet since C/1995 O1 (Hale-Bopp) and we triggered target-of-opportunity observations with the IRAM-30m, NOEMA, ALMA, CSO, Nançay and Odin radiotelescopes. The water outgassing was monitored via observations of the OH radical at 18-cm with the Nançay radiotelescope from December to March 2015. Observations of H_2O and $H_2^{18}O$ with the Odin submillimeter space telescope were carried out between 30 January and 03 February.

The comet was observed with the IRAM-30m radiotelescope in Spain on January 13.8, 15.8 and 16.8, with some complementary observations on January 23.7, 24.7, 25.7 and 26.7 under good weather. One objective was to support the ALMA program 2013.1.00686.T (PI S. Milam). It was also observed with NOEMA (25.8 and 28.8 January, PI J. Boissier) and shortly with CSO on February 13.3 and 16.3 UT.

We will present here the analysis of the IRAM data set, which is the most sensitive survey of the molecular content of a comet ever obtained since comet Hale-

Bopp. We covered ≈ 48 GHz of the 1mm band (Fig.1) enabling the detection of over 20 molecules plus radicals and isotopologues.

We will present the measured molecular abundances and sensitive upper limits obtained on a number of complex molecules and of particular (prebiotic) interest. The comet seems relatively depleted in organic molecules compared to our sample of comets investigated at submillimeter wavelengths ([6, 1, 2, 3, 4, 5]).

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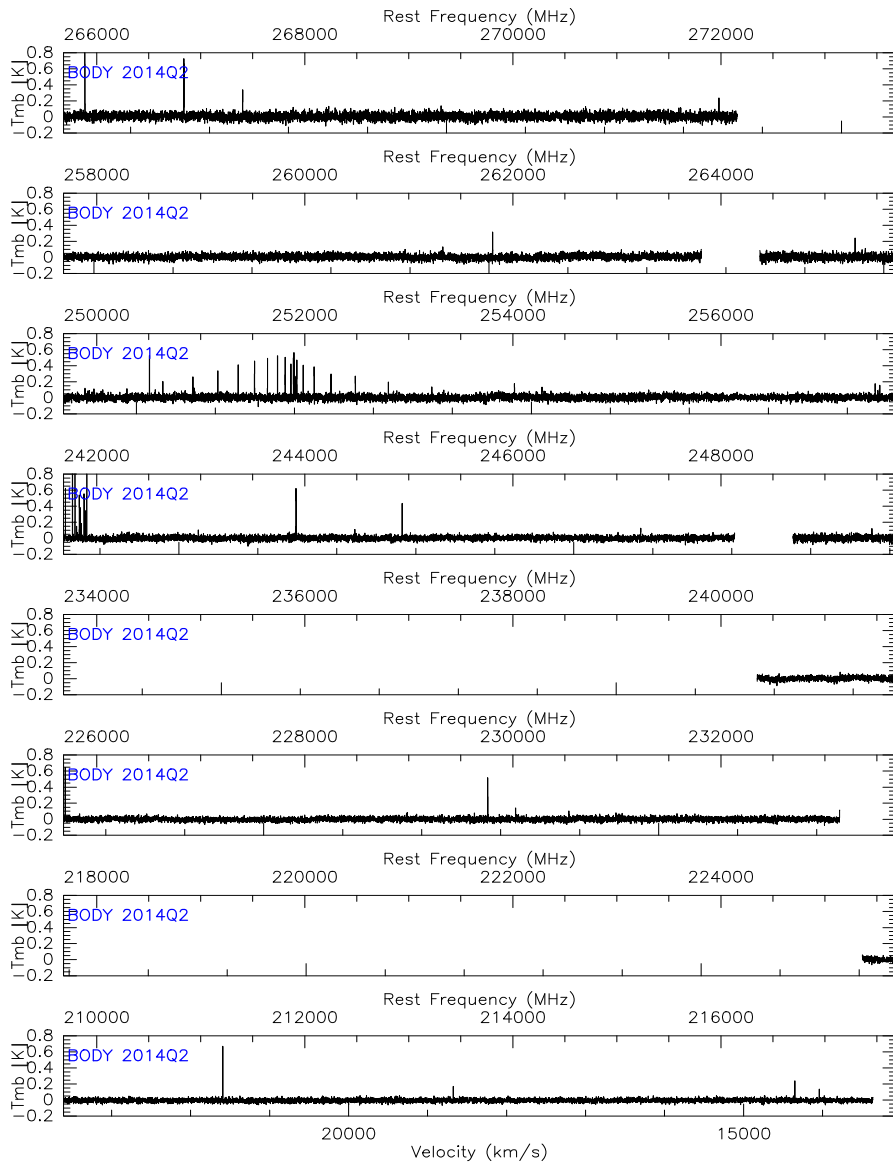


Figure 1: Spectra of comet C/2014 Q2 (Lovejoy) obtained on 13.8 January 2015 with the IRAM-30m.