

## Abundance of complex organic molecules in comets

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The IRAM-30m submillimetre radio telescope has now an improved sensitivity and versatility thanks to its wide-band EMIR receivers and high-resolution FFT spectrometer. Since 2012, we have undertaken 70 GHz wide spectral surveys in the 1-mm band in several comets: C/2009 P1 (Garradd), C/2011 L4 (PanSTARRS), C/2012 F6 (Lemmon), C/2012 S1 (ISON), and C/2013 R1 (Lovejoy).

Since their discovery in comet C/1995 O1 (Hale-Bopp) in 1997 (Bockelée-Morvan et al. 2000, Crovisier et al. 2004a, 2004b), we have detected complex CHO(N)-molecules such as formic acid (HCOOH), formamide (NH<sub>2</sub>CHO), acetaldehyde (CH<sub>3</sub>CHO), and ethylene glycol ((CH<sub>2</sub>OH)<sub>2</sub>) in several other comets. HCOOH has now been detected in 6 other comets since 2004, and formamide, ethylene glycol, and acetaldehyde were re-detected for the first time in comets Lemmon or Lovejoy in 2013 (Biver et al. 2014). We will present the abundances relative to water we derive for these species, and the sensitive upper limits we obtain for other complex CHO-bearing molecules. We will discuss the implication of these findings on the origin of cometary material in comparison with observations of such molecules in the interstellar medium.

**References:** Biver, N., Bockelée-Morvan, D., Debout, V., et al. 2014, A&A submitted; Bockelée-Morvan, D., Lis, D.C., Wink, J.E., et al. 2000, A&A, 353, 1101; Crovisier, J., Bockelée-Morvan, D., Biver, N., et al. 2004a, A&A, 418, L35; Crovisier, J., Bockelée-Morvan, D., Colom, P., et al. 2004b, A&A, 418, 1141.