COMPLEX ORGANIC MOLECULES : FROM LABORATORY STUDIES TO SPACE DETECTION

L. MARGULÈS, G. WLODARCZAK, J. DEMAISON, *Laboratoire PhLAM, CNRS UMR 8523, Université de Lille 1, Bat. P5, 59655 Villeneuve d'Ascq Cedex, France.*; K. DEMYK, *Centre d'Étude Spatiale des Rayonnements, Université de Toulouse 3, France*; M. CARVAJAL, *Departamento de Fìsica Aplicada, Universidad de Huelva, Spain*; R. MOTIYENKO, *Institute of Radio Astronomy of NASU, Kharkov, Ukraine*; I. KLEINER, and L. H. COUDERT, *LISA, CNRS UMR 7583, Université Paris 12, 61 Av du General de Gaulle, 94010 Créteil Cedex France..*

New instruments such as the Herschel Space Observatory, the interferometer ALMA and the airborne observatory SOFIA, will give access to the unexplored submillimeter spectral range. However few laboratory data exist in this frequency range for molecules of astrophysical interest and a huge preliminary work should be done to permit the analysis of future data. In this context we have studied the isotopic species of two abundant molecules in the ISM and prestellar cores: methyl formate ($HCOOCH_3$) and ethyl cyanide (CH_3CH_2CN). **Ethyl Cyanide :** The 3 ^{13}C-substituted istopologues of ethyl cyanide were studied. Thanks to the resulting accurate prediction we have identified several tens of lines of each isotopologues in Orion [a]. The mono-deuterated species have also been investigated because the D-enrichment allows their interstellar detection in hot cores or corino. We will present our last results concerning the ^{15} N and mono-deuterated species. New spectroscopic constants were derived allowing for their detection in the ISM.
Methyl Formate : The internal rotation barrier is lower than in ethyl cyanide, and most of lines are split into two components : A and E components respectively. $HCOOCH_3$ in its first torsional state was recently detected in W51 e2 [b] and Orion [c]. We will present our recent work on the $HCOO^{13}CH_3$, $DCOOCH_3$, $HCOOCH_2D$ isotopic species. In the case of $HCOOCH_2D$, the torsion of the CH_2D group has to be taken into account.

[a] K. Demyk, H. Mäder, B. Tercero, J. Cernicharo, J Demaison, L. Margulès, M. Wegner, S. Keipert, and M. Sheng, *Astron. Astrophys.* **466**, 255-259 (2007)
[b] K. Demyk, M. Carvajal, and G. Wlodarczak, *submited to Astron. Astrophys.*
[c] K. Kobayashi, K. Ogata, S. Tsunekawa, and and S. Takano, *ApJ.* **657**, L17 (2007)