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Spectral line survey toward Orion KL

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Abstract. We have carried out a sensitive, fully single side band reduded and line confusion limited survey toward Orion KL with the IRAM 30 m telescope. We have covered all the frequencies allowed by the 30 m (more than 168 GHz): 80-115.5 GHz, 130-179 GHz and 197-281 GHz. We present the data and the strategy for the data reduction and line identification. In addition, we present the first results like the detection of $Si^{18}O$ and $Si^{17}O$ for the first time in the space.

Keywords. astrochemistry, line: identification, surveys, ISM: clouds, ISM: lines and bands, ISM: molecules

1. Introduction

The Orion KL cloud is the prototype of high mass star forming region and one of the best studied regions of our galaxy. The chemistry in this cloud is particularly rich resulting from the interaction of the newly formed stars and their environment. The evaporation of dust mantles in some regions of the KL cloud produces complex molecules in the gas phase which are responsible of a spectacularly prolific line spectrum. Many line surveys have been performed in this region in the last 20 years (Johansson *et al.*, 1984; Jewell *et al.*, 1989, Turner 1989; Blake *et al.*, 1986, 1996; Ziurys & McGonagle 1993; Schilke *et al.*, 1997, 2001; Comito *et al.*, 2005) but no systematic surveys, and highly sensitive, of this exciting source had been done, so far with the IRAM instruments. Completed frequency coverage in line surveys is the best way to unders tand the chemical complexity of molecular sources.

2. Observations, data reduction and line identification

We carried out the observations during September 2004, March 2005 and April 2005. We covered all the ranges of frequency allowed by the telescope down to the proposed S/N (line confusion limit). The observing time per setting to reach this limit was about 10 minutes in all the frequencies. Due to the high line density in Orion, and in spite of the good band rejection of the 30 m receivers, each frquency setting was repeated at a slightly shifted frequency (20 MHz, no new tunnig needed) in order to allow the separation of all lines arising from the image side band. However, this scheme does not guarantee that all lines blended with ISB features could be fully characterized. The main source for line identification is the millimeter and submillimeter line catalog created and maintained by one of us (J. C.) with 1250 molecular species. The catalog is accompained by a set of routines that allow the computation of LTE spectra for all molecular species and LVG code providing calculations for more than 500 species (main and rare isotopologues of most known ISM molecular species). Many U lines will probably correspond to isotopologues and vibrational excited states of well known molecules like CH_3OCH_3,

CH_3OH, $CH_3(O)COH$... As an example we show in the next figures detections of rare isotopologues:

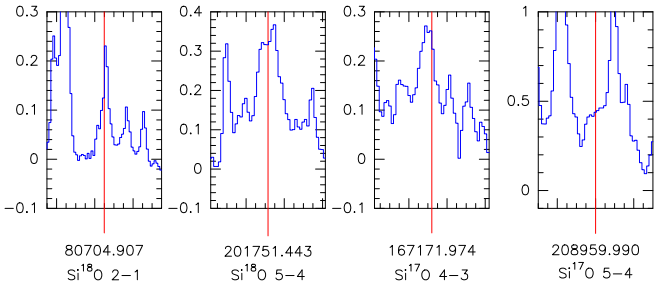

Figure 1. *$Si^{18}O$ and $Si^{17}O$ detection. The y axes is T_A^* (K) and the x axes is the Rest Frequency (MHz). Each box covers the same range in frequency (60 MHz)*

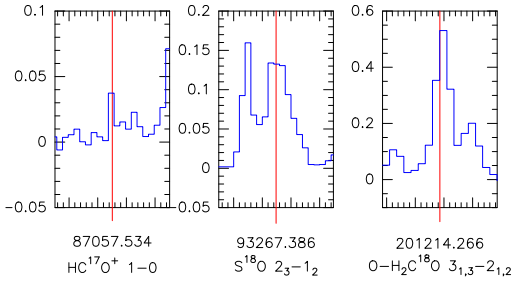

Figure 2. *The y axes is T_A^* (K) and the x axes is the Rest Frequency (MHz). Each box covers the same range in frequency (20 MHz)*

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References

Blake *et al.* 1986, *ApJS* 60, 357
Blake *et al.* 1996, *ApJ* 472, L49
Comito *et al.* 2005, *ApJS*, 156:127-167
Jewell *et al.* 1989, *ApJS* 70, 833
Johansson *et al.* 1984 *A&A* 130, 227
Schilke *et al.* 1997, *ApJS* 108, 301
Schilke *et al.* 1995, *ApJS* 132, 281
Turner, B. E. *et al.* 1989, *ApJS* 70, 539
Ziurys & McGonagle 1993, *ApJS* 89, 155