"III Congreso Latinoamericano de Astrobiología (2021)"
Revista Mexicana de Astronomía y Astrofísica Serie de Conferencias (RMxAC), **55**, 97–97 (2023)

https://doi.org/10.22201/ia.14052059p.2023.55.33

MOLECULAR CONTENT OF ULTRACOMPACT H II REGIONS

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We present preliminary results of the study of the molecular content of a sample of 99 ultra-compact (UC) H II regions in the 3 mm band using the 30 m IRAM radio telescope. About 20 molecular species were detected, some of them with several transitions. Triatomic molecules were the most common, with CCH, HCN, HCO^+, HNC and $N2H^+$ being detected in all sources the sample. From this study, some chemical and physical properties are determined in different galactic environments.

Astrochemistry studies the formation and destruction of molecules in astronomical environments. Of particular importance is the understanding of the high-mass star-forming process, since these stars play a transcendental role in the energetic and chemical evolution of our Galaxy. One way to contribute to the understanding of this process is to characterize the molecular environment in one of its earliest phases, such as the UC H II region. Two of the traditionally used molecules are NH_3 and CO. However, in recent years other tracers have been shown to be more effective in studying molecular content, for example $N2H^+$ and HCO^+ (e.g., Jørgensen, Belloche & Garrod 2020). For this reason, systematic surveys of different molecular transitions towards these type of objects are important to understand the role played by different molecules in the formation process of massive stars.

We observed a sample of 99 UC H II regions from the catalog of 586 sources of Urquhart et al. (2011). All selected sources have water maser and ammonia emission. Observations were carried out with the 30 m IRAM radio telescope using the 3 mm band with a coverage of $85.8-93.5$ GHz. The observations covered the frequencies of NH_2D, HCN and HCO molecules and, the data calibration was performed with the CLASS package.

Observations of the 99 ultracompact H II regions show a rich chemical diversity. About 20 molecular species were detected, some of them having several transitions. An example of the spectral lines detected toward one UC H II region of the sample is shown in Figure 1. In general, all observed sources are rich in their molecular content, regardless of their morphological type. However, no clear correlation is found between their molecular richness and their luminosity; moreover, there is also not a direct relationship with the ammonia intensity or the water maser emission. On the other hand, the intensity of the molecular lines is not directly related to the distance from the sources.

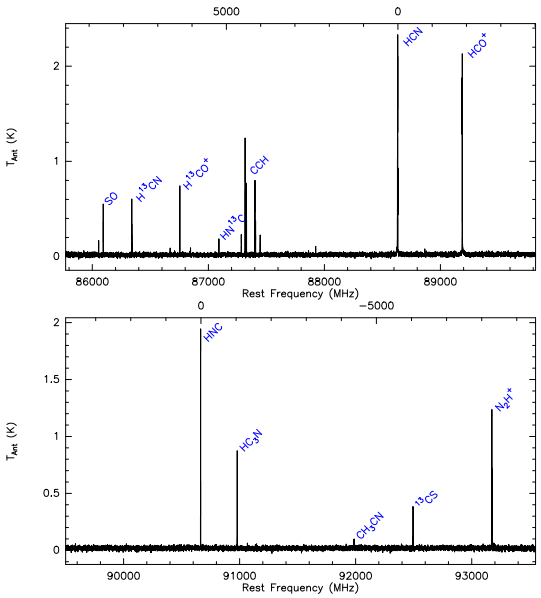

Fig. 1. Spectra of the UC H II region G010.8411-02.5919. The spectra show a large diversity of molecular lines. In general, all the sources in the sample show a similar trend. V_{LSR}, centered at the position of the strongest spectral line, is shown on the upper axis.

The molecular species detected contain mainly from two to five atoms, with triatomic molecules being the most common. CCH, HCN, HCO^+, HNC and $N2H^+$ were detected in all sources the sample. Tentatively, we found that in the sample, the molecular transitions trace three different environments: cold dense gas, shocked gas and ionized gas.

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