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DEUTERATION AND FRAGMENTATION IN HIGH-MASS STAR-FORMING REGIONS

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Fragmentation is one of the main parameters in star-formation, and apparently there is no correlation between the fragmentation of a region and its physical properties (Palau et al. 2013). But what about its chemistry? Here we characterize the fragmentation and calculate the deuteration fractions for a group of high-mass star-forming regions, and discuss what the relationship between them tells us.

In the last decade, we have started to spatially resolve the small gas and dust condensations in high-mass SFRs (star-forming regions) that will eventually become a massive star or system, finally being able to describe how those SFRs fragment. The apparent lack of correlation between the fragmentation of a SFR and its physical properties motivated us to study possible correlations between the fragmentation and the chemical properties of high-mass SFRs.

Our sample consist of the SFRs IRAS 19410+2336 (i10), the northern and southern regions of IRAS 06056+2131 (i56n and i56s, respectively), and IRAS 06058+2138 (i58; e.g., Rodón 2009; Rodón et al. 2012). To characterize their fragmentation, we derived their Core Mass Functions in the form $\Delta M/\Delta N \propto M^{-\beta}$ from PdBI and SMA 1 mm continuum observations ($\sim$ 1″ resolution), obtaining the β values shown in Col. 7 of Table 1.

According to Fontani et al. (2011), an interesting chemical property to investigate is the deuteration fraction [D/H], since it can be used as a chemical clock. This [D/H] is defined as the ratio of the column densities of a *D*-bearing molecule and its *H*-bearing counterpart. To derive [D/H] in our sample, we used DCN(3-2) and HCN(3-2) line emission obtained with the IRAM 30m telescope. We integrated the line emission within a single $\sim$ 11″ beam towards the interferometric continuum peaks, and then calculated the column densities with CLASS and the MADCUBA_IJ software. The results obtained are shown in Table 1.

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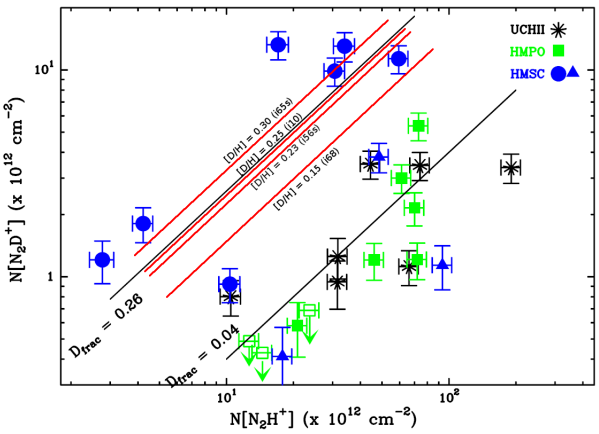

Fig. 1. [D/H] for different classes of pre- and protostellar high-mass objects. Red lines mark the regions of our sample. (Adapted from Fontani et al. (2011).)

The [D/H] values obtained are similar to those calculated by Fontani et el. (2011) for High-Mass Starless Core candidates (HMSC), as can be seen in Fig. 1. However, our regions are far from being HMSCs, since all of them show clear signs of ongoing star formation (e.g., Rodón 2009, Rodón et al. 2012). This apparent contradiction is due to the HCN lines being optically thick. At the moment of writing, we are analyzing the data to correct the [D/H] values for optical depth effects. Until the [D/H] values are revised, no conclusions can be drawn regarding the relationship between fragmentation and deuteration.

TABLE 1

LINE PROPERTIES, CMF INDICES, AND [D/H]

Source	I_ν (K.km/s)		log N/cm^{-2}		[D/H]	β
	DCN	HCN	DCN	HCN		
i19410	1.41	6.72	12.14	12.75	0.25	2.2
i06058	1.61	9.07	12.05	12.88	0.15	1.6
i06056n	0.86	3.39	11.92	12.45	0.30	1.7
i06056s	1.04	5.17	12.01	12.64	0.23	

REFERENCES

Fontani et al. 2011, A&A, 529, L7
Palau et al. 2013, ApJ, 762, 120
Rodón 2009, PhD thesis, MPIA, Heidelberg, Germany
Rodón et al. 2012, A&A, 545, A51