MILLIMETER AND SUB-MILLIMETER SPECTROSCOPY OF DOUBLY DEUTERATED ACETALDEHYDE (CD_2HCHO)

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In the last years the number of multi-deuterated molecules detected in the Interstellar Medium (ISM) increased substantially. These molecules are found to be more abundant than expected when taking into account the ISM deuterium abundance (D/H = $2.0 \pm 0.1 \times 10^{-5}$, Drozdovskaya *et al.*[a] and references therein). In order to better understand the nature of deuterium fractionation, and the interplay of the chemistry in the gas phase and on the surface of dust grains, chemical models need to be constrained by observations of singly- and multi-deuterated molecules. Doubly deuterated acetaldehyde (CD_2HCHO) has not been detected in the ISM yet as it has been studied in the laboratory only up to 40 GHz (Turner & Cox[b], Turner *et al.*[c]) and hence lacks an extensive spectroscopic study, in contrast with the singly-deuterated forms CH_2DCHO and CH_3CDO that were detected towards the protostellar core IRAS16293-2422B (Coudert *et al.*[d]). In order to allow the first detection of CD_2HCHO in the ISM, and to understand its deuterium fractionation, we are studying the rotational spectrum of CD_2HCHO in the millimetre and sub-millimeter frequency range. This work should allow us to obtain an accurate spectral catalogue for CD_2HCHO, which we will use to search for this molecule in star-forming regions.

[a] Drozdovskaya, M. N., Coudert, L. H., Margulès, L., Coutens, A., Jorgensen, J. K., Manigand, S., 2022, A&A, in press

[b] Turner, P. H., Cox, A. P., 1976, Chem. Phys. Lett., 42, 1

[c] Turner, P. H., Cox, A. P., Hardy, J. A., 1981, J. Chem. Soc., 77, 1217-1231

[d] Coudert, L. H., Margulès, L., Vastel, C., Motiyenko, R., Caux, E., Guillemin, J.-C., 2019, A&A, 624, A70