Investigating the relation between diffuse molecular gas and the dark neutral medium.

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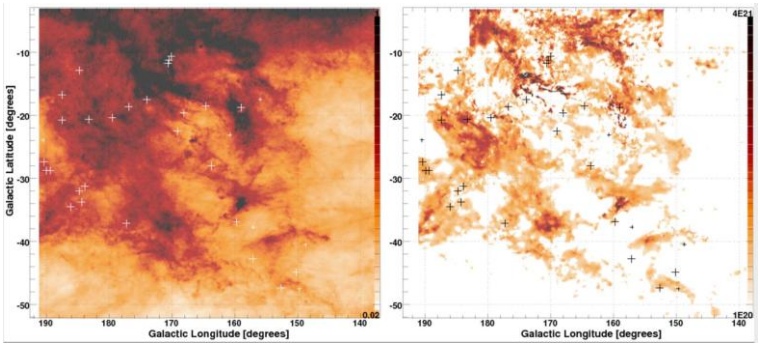
Analysis of interstellar clouds has shown the presence of a dark component of the neutral gas that is not traced well by λ21cm HI or λ2.6mm CO J=1-0 emission, but represents 20% of the total gas mass, and is often more massive than the CO-bright molecular part [1]. Sensitive mm-wave absorption spectroscopy of HCO^+, CO and other species toward radio bright QSOs probes this dark neutral medium and determines $N(H_2)$ and N(CO) in the diffuse molecular gas. In this regime, at the onset of the HI-H2 transition, most of the carbon is singly ionized and the CO abundance is modest, resulting in CO emission below the detection threshold of CO sky surveys. In ALMA observations along 13 directions in Chamaeleon [2] and 33 new directions in nearby anticenter clouds, we show that HCO^+ is detected in 41 of the 46 directions, of which only 10 have CO emission above 1 K-km s^{-1} after a sensitive CO emission study at the IRAM 30m telescope. The broad frequency coverage and high sensitivity offered by NOEMA will allow sensitive spectral surveys of the diffuse gas in the DNM, thus allowing a better understanding of its physical conditions and chemical richness.



Location of the QSO sight-lines on top of maps of the reddening (left) and the DNM column density from Remy et al. (2018) (right)

References

[1] Remy Q. Grenier I.A., Marshall D.J., Casandjian J.M., A&A 611, A51 (2018)

[2] Liszt H., Gérin M., Grenier I.A., A&A 627, A95 (2019)