Contribution ID: **47** Type: **Review/Invited talk**

Characterizing the emission of molecular clouds using a sampling technique

Tuesday 6 May 2025 10:20 (20 minutes)

Characterizing the molecular emission from whole molecular clouds is critical to identify the physical and chemical processes that act at different spatial scales and lead to the formation of stars. It is also needed to connect spatially-resolved observations of galactic clouds with extragalactic observations that do not resolve the clouds.

The traditional approach of characterizing the emission of clouds using mapping techniques is very time consuming since it requires fully sampling the emission over many square degrees in the sky, and for this reason, it can only be carried out over a very limited sample of clouds. As an alternative to mapping, we have developed a new technique of characterizing the multi-line emission from clouds using statistical sampling. Our method uses available extinction maps to select a relatively small sample of cloud positions that cover the full range of column densities in the cloud, and that can be observed with only a modest investment of telescope time

We present the results of applying our sampling technique to the three nearby clouds California, Perseus, and Orion A, for which we have used the IRAM 30m telescope to cover the full 3mm wavelength band. Although the clouds present very different rates of star formation, their emission properties are remarkable similar, and the intensity of all their tracers correlates strongly with the amount of column density. The observed similarities in the emission suggest that despite their star-forming differences, the clouds have a similar underlying physical structure and a chemical composition dominated by a few critical ingredients that include outer photodissociation, inner freeze out, and localized stellar feedback.

Primary author: TAFALLA, Mario (Observatorio Astronomico Nacional (Spain))

Co-authors: Dr USERO, Antonio (Observatorio Astronomico Nacional (Spain)); Dr HACAR, Alvaro (University of Vienna)

Presenter: TAFALLA, Mario (Observatorio Astronomico Nacional (Spain))

Session Classification: Session 1a