Contribution ID: **27** Type: **not specified**

Giovanni Sabatini - First ALMA maps of cosmic ray ionization rate in high-mass star-forming regions

Tuesday, 13 June 2023 12:25 (20 minutes)

Low-energy cosmic rays (<1 TeV) are a pivotal source of ionisation of the interstellar medium, where they play a central role in determining the chemical gas composition and, in turn, in influencing the formation of stars and planets. Observations of H_3^+ absorption lines in diffuse clouds – n(H_2)~10^2 cm^{-3} – have been used for decades to provide reliable estimates of the cosmic ray ionisation rate relative to molecular hydrogen (ζ_{H2}). However, in denser clouds where stars and planets form, this method is often inefficient since H_3^+, similar to H_2, does not emit rotational lines as it does not have a permanent electric dipole. The ζ_{H2} estimates are, therefore, still provisional in this context, and represent one of the least understood ingredients when it comes to defining general models of star formation. Recently, a new analytical approach to estimate ζ_{H2} in the densest regions of molecular clouds has been proposed by Bovino et al. (2020), based on observations of ortho-H_2D^+ as the main observational constraint to derive the amount of H_3^+. This has been applied by Sabatini et al. (2020) in a large sample of high-mass star-forming regions. Exploiting the exceptional observational capabilities of ALMA, in this talk I will present the first high-resolution maps of ζ_{H2} in two massive clumps. I will present these results and the way they provide crucial constraints for the chemical/physical modelling of star-forming regions.

Session Classification: Milky Way