

Cosmic rays are believed to play an essential role in determining the chemistry and the evolution of molecular clouds. This is because they are usually considered to be the main ionization agent of these star-forming regions. Recent theoretical estimates have found that the predicted ionization rate of many cosmic-ray transport models using the local cosmic-ray spectra is about 10 to 100 times smaller than the one inferred from the observational data. This seems to indicate that the observed spectrum is local and, thus, it opens up new possibilities to model properly the Galactic cosmic-ray spectrum at low energy to better understand the ionization rate which is of critical importance to pave the way for future research in Star Formation. More interestingly, a few molecular clouds in the vicinity of cosmic-ray sources are observed to have an enhanced ionization rate which seems to be of cosmic-ray origin and might allow us to put some constraints on the low energy part of the cosmic-ray spectrum around these sources. In this talk, we will briefly discuss some of the theoretical investigations of cosmic-ray transport in molecular clouds and the possible interpretations of observed ionization rates on both the diffuse Galactic cosmic ray spectrum and the one around cosmic accelerators down to energy below 1 GeV.

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