
Galactic Cosmic-Ray Propagation and the Ionization Rates in Molecular Clouds

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Abstract

Cosmic rays are generally believed to play an important role in determining the physical and chemical evolution of star-forming regions as they are the only capable agent to penetrate and ionize the interior of molecular clouds. In this respect, the impact of cosmic rays on molecular clouds could be quantified by the so-called cosmic-ray-induced ionization rate. Interestingly, theoretical estimates of the ionization rate assuming the cosmic-ray spectra observed in the local interstellar medium normally result in the ionization rate being one to two orders of magnitude below the values inferred from observations. Such a discrepancy might be resolved by arguing that the local cosmic-ray spectra are not representative for the entire Galaxy. In this talk, we will discuss the variations of cosmic-ray density at different positions in the Milky Way and how they could help explain the surprisingly high ionization rates observed in many molecular clouds.

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