CAN WE USE METASTABLE HELIUM TO TRACE THE COSMIC-RAY IONIZATION RATE?

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The ionization rate of interstellar material by cosmic rays has been a major source of controversy, with different estimates varying by three orders of magnitude. Direct observational measurements of this rate have all depended on analyzing the chemistry of various molecules such as OH, HD, HCO^+, H_3O^+, and H_3^+, which are produced following cosmic-ray ionization. In many cases the chemical analyses contain important uncertainties; even in the simplest case, that of H_3^+, the derived ionization rate depends on an (uncertain) estimate of the absorption path length. The reaction network producing metastable helium, on the other hand, is believed to be extremely simple, thus providing a direct measure of the cosmic-ray ionization rate. We present spectroscopic observations made searching for the 10830 Å absorption line of He I* due to interstellar material in the first attempt to utilize this probe. We will then discuss complications to the metastable helium chemistry, and examine the instrumental capabilities needed to utilize this new probe of the ionization rate.

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