COSMIC-RAY IONIZATION AND HAZES ON HOT JUPITERS

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The chemical evolution of life begins in the diffuse interstellar medium and culminates in the atmosphere and on the surface of a planet. The origin of life on earth took place when the sun's magnetic winds more efficiently reduced the number of ambient galactic cosmic ray (CR) particles of energy < 1 GeV. We consider the chemical effect of galactic cosmic ray exclusion on a giant gas planet < 1 AU from its host star. Taking our previous work on CR ionization within the atmospheres of free-floating planets as a starting point, we utilize an ion-neutral chemical network for atmospheres under initial conditions and physical parameters for a giant gas planet. These initial conditions and parameters are determined by the Drift-Phoenix model atmosphere code, which simultaneously treats radiative transfer and dust nucleation, settling and growth. Two cases are explored: a terrestrial CR spectrum and the same spectrum with a cut-off at 1 GeV. In the second case, we find a reduction in complex carbon species, e.g. C_2H_2 and C_2H_4, in the upper atmosphere. This result has implications for the haze observed on GJ 1214b.