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Evidence of Enhanced Ionization During Early Planet Formation

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There is growing observational evidence that giant planet formation happens early, within a million years of the coalescence of the protoplanetary disk. Ionization rate is one of the most important parameters controlling both the chemical and dynamical processes in these disks. What few observational constrains on ionization currently exists suggest overall low ionization, limiting the processes able to take place. This is seemingly in conflict with chemical models which demonstrate the importance of ionization for the chemical processing of volatile carbon and observations which suggest such processing is ubiquitous and happens quickly. I will present new NOEMA observations which, when combined with chemical modeling, are indicative of enhanced ionization rates in the envelopes of three Class I protostars. I will then discuss the potential impact of this early enhancement on the chemical composition of the material available to forming planets.