P226a Central Star and Nearby Massive Star Influence on UV Synthesis of Organics in Protoplanetary Disks

I. J. Manoraj, S. Okuzumi, K. Homma (Institute of Science Tokyo)

Planets are thought to form in protoplanetary disks from micron-sized dust grains that coagulate and grow into full-sized planets. The beginning stages of planet formation is inefficient in the outer parts of the disk, where the grains are often mantled by an ice layer that can contain simple molecules. When exposed to UV radiation, radicals are formed within the ice mantle. Once the grains drift inside the snow line, the warming and sublimation of ices can trigger organic synthesis on the grains.

In addition to radiation from the interstellar medium (ISM), two other sources, irradiation from the disk's central star, and nearby massive stars, play an important role in facilitating organic synthesis. We perform a vertical dust size evolution simulation and calculate the abundance of radicals inside icy grains produced by UV irradiation. We consider the effects of the central star's FUV continuum emission and Lyman-alpha emission seprately, each characterized by different transport mechanisms in the disk. We find that, due to the enhancement in flux via the additional radiation sources, radicals are formed both at a higher quantity, and at a faster rate. Additionally, we find that the Lyman-alpha emission of the central star plays a significant role in forming radicals in the disk due to its scattering by the atomic hydrogen layer on the disk surface, allowing photons to penetrate deeper into the disk interior. Our results suggest that there could be more organics formed once grains drift inward than previously thought, contributing to rapid growth in the inner disk.