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Simulating Organic Molecules in the Protostellar Disk to Understand the Origins of Life

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Protostars possess remarkably complex chemistry throughout their various regions. The chemistry of the protostellar disk is of particular importance, as this is where planets are widely thought to form. The outer disk possesses low temperature and high density, making it uniquely well suited for the formation of simple organic molecules. Understanding the chemical abundances of organic molecules in the disk could provide important insights on the origins of life. RadChemT is a novel code which simulates astrochemistry for protostars in star forming regions. Its initial primary use was to simulate the relative densities of CO species throughout a protostellar region. The model proved to be accurate compared with observations of the protostar L1527. However, recent ALMA observations of L1527 indicate gas-phase presence of simple organic molecules, which were predicted to freeze out by RadChemT. Thus, new physical methods for desorption of these molecules from the dust grains are being explored, with the goal of accurately simulating these observations. Initial results indicate that the code can efficiently simulate abundances for all regions other than the outflow cavity, and that chemical desorption may account for the gas phase presence of simple organic molecules in the outer disk. We present results showing the effect of the new desorption mechanism on the chemistry model.

Thursday, April 18th, 2024
3:05 – 4:20 PM

In-person: BIOS 241