Contribution ID: **20** Type: **Presentation**

Chemical effects of episodic accretion

Friday 25 March 2022 13:50 (20 minutes)

An important problem that molecular astrophysics faces is to understand where, when and how complex organic and prebiotic molecules emerge. To form the basic building blocks of life – for example amino acids or sugars – molecules have to go through many complex chemical reactions between many different species. The origins of these biomolecular precursors are an ongoing research field, however observations show that they already arise in star-forming regions. Such molecules, including methanol, methyl formate, formamide and other complex organic molecules, form through gas- and solid-state chemistry. For instance, methanol is formed from carbon monoxide (CO) on grain surfaces through hydrogenation steps. Keeping CO in the solid state to form more complex species, however, requires a cold environment (less than ∼20K). Therefore, temperature and other physical parameters might have an impact on the chemistry in star-forming regions. Over the last year a picture has emerged where young stars accrete gas and dust in a highly episodic manner with, e.g., strong bursts of accretion related to the formation of disks and binaries. This may strongly affect the chemistry as the luminosity of the protostar and thus the temperature in the envelope and disk surrounding the young star will vary significantly compared to what one would expect from simple classical infall models. In this project we characterise the chemical effects of a changing environment around a protostar. We make simple simulations where we couple our chemical network with an underlying physical model of the environment. We explore the significance of, for example, the length, frequency and magnitude of bursts and the density of the envelope on the formation of chemically interesting molecules. We find that many species are affected more than the uncertainty of the network and thus could leave a mark on the observations. Comparing our results to widely spread observations of various species, one could make assumptions on the history of different protostars.

Field of study

Astrophysics

Supervisor

Jes K. Jørgensen

Primary author: FRISS, Gergely

Presenter: FRISS, Gergely

Session Classification: Student talks