Modeling the Chemical Impacts of Luminosity Outbursts in Protostellar Envelopes

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More and more large spectral surveys are carried out in the radio/submm/mm range to characterize the molecular composition of star forming regions. The observational studies carried out so far seem to indicate that the chemical content differs between protostars. With chemical models, it is possible to test different scenarios and better understand the possible origins of these differences.

In this study, we investigate the impact of luminosity outbursts on the chemical composition of solar-type protostars. Accretion bursts and consequently luminosity outbursts are experienced by some young stellar objects. The sudden rise in temperature caused by luminosity outbursts can sublimate the molecules frozen on the dust grains. The release of new molecules into the gas phase with the temporary increase in temperature could affect the long-term evolution of the chemical composition of protostellar systems. We used the dynamic physical APE code to calculate the 1D evolution of particles in a protostellar envelope. We also ran models implementing luminosity outbursts by modifying the previously determined temperature. The physical evolution of the density and temperature was then used as inputs of the Nautilus gas-grain chemistry code (updated to take into account a better description of the complex organic molecules) to predict the evolution of the molecular abundances from the cold outer regions to the warm inner regions. This poster will summarize our results on the predicted impact of luminosity outbursts on the chemical composition of protostellar envelopes.