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 want to investigate the impact of luminosity outbursts on the chemical composition of solar-type protostars. Accretion bursts and consequently luminosity outbursts can be 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 the protostar. We used the APE code (Marchand et al. in prep.) to model the 1D evolution of a protostellar envelope. We produced a grid of models with luminosity outbursts occurring at different times of the protostellar collapse. The physical evolution of the density and temperature of the different models was then used as inputs of the Nautilus gas-grain chemistry code (Ruaud et al. 2016) to predict the evolution of the molecular abundances from the cold outer regions to the warm inner regions. In this presentation, I will summarize our preliminary results on the expected impact of luminosity outbursts on the chemical composition of protostellar envelopes.