ASTROCHEMISTRY OF STAR FORMING REGIONS: FROM SINGLE DISH TO INTERFEROMETRIC OBSERVATIONS

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The story of a Solar type system starts from an initial molecular clump and ends up into a specific planetary system, with its bag of organic complexity acquired during its evolution. In the first step, the so-called prestellar core phase, the grains become coated with icy mantles, containing simple hydrogenated molecules and perhaps more complex ones. The molecules composing these mantles are crucial for the subsequent chemical development, since they constitute the bricks for more complex organic molecules. In a second step, when the collapse sets in, a central source is formed and heats up the dust around, likely surrounded by a circumstellar disk where the process of planet formation starts. Simultaneously with the collapse, material is ejected outwards causing shocks along the path. Heat and shocks release the content of the icy dust mantles into the gas, triggering a series of reactions that perhaps synthesize more complex molecules in the gas. A plethora of complex molecules are observed in hot corinos and molecular shocks. Probably, these molecules subsequently freeze-out into icy mantles in the denser and coldest zones of the protoplanetary disk and are "passed on" to the forming planets, comets and asteroids. Thus, the questions that astrochemical community needs to answer to build a reliable theory of the dawn of organic chemistry are: Which organic molecules are formed, where, when and how? The discovery of COMs (Complex Organic Molecules) in Solar type hot corinos demonstrated that molecular complexity is not an exclusive prerogative of high mass hot cores and, most important, setting a direct link between organic chemistry in the interstellar medium and in the Solar System. More recently came the discovery that COMs can be also present in prestellar cores, against theoretical expectations, and in outflow shocks close to Solar type forming stars. I will present the results from 2 IRAM Large Programs (ASAI and SOLIS) on the chemical composition of Solar-like protostars and will then present the need for a much higher spatial resolution. This need will be covered by the FAUST ALMA Large Program (http://stars.riken.jp/faust/fausthome.htm), which attacks the issue of the chemical diversity of young Solar-like systems at planet-formation scales (50 au). I will also present how the community is organizing to develop tools, useful for an easy line identification in spectral surveys, as well as their links with radiative transfer modelling (e.g. CASSIS: http://cassis.irap.omp.eu/).