Proposta di Tesi in Astrofisica

Università di Firenze, dipartimento di Fisica e Astronomia

Titolo – Chemical compexity of Planet forming disks

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Correlatore - TBD
Data -

Tipologia – magistrale o di dottorato

Propedeuticità – Fisica del mezzo interstellare

Abstract-
A key open question in astrochemistry is how chemical complexity builds up along the formation process of Sun-like stars from prestellar cores to protoplanetary disks and ultimately to planets. Is the chemical composition of planets inherited from the prestellar and protostellar stages? Or it reflects chemical processes occurring in the disk? Are organics efficiently formed in disks and through what mechanism(s)? The chemistry of disks is difficult to probe observationally due to their small sizes (< a few hundreds of au) and to the low gas-phase abundance of (complex) organic molecules (iCOMs). It is only with the advent of millimetre interferometers that we started to unveil the disks molecular content at unprecedented angular resolution and sensitivity. The master/PhD project is aimed to investigate the chemistry of protoplanetary disks by analysing ALMA observations of molecular lines and continuum emission at subarcsecond resolution. The master/PhD student will reduce and analyse millimetre single-dish and interferometric data and will use radiative transfer codes to analyse the detected lines and derive the gas physical conditions and molecular abundances. The distribution, kinematics and abundance of the detected molecular species will be compared with the predictions from thermo-chemical disk models to constrain the formation mechanisms of (complex) organics in protoplanetary disks. The connection between the disk chemistry and the dust properties (growth, settling, opacity, presence of substructures) will also be investigated. Finally, the chemical composition of the protoplanetary disks will be compared with that observed in comets, which preserve a nearly pristine record of the Solar Nebula composition.