Astrochemistry of pre-biotic molecules in high-mass star forming regions in preparation of the SKA observations.

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The goal of this project is to achieve scientific and technological skills associated with one of the major infrastructures being built nowadays, the Square Kilometer Array (SKA).

From the scientific of view, the research is based on the study of pre-biotic molecules in high-mass star-forming regions, for which high-angular resolution and sensitivity, such as those provided by large interferometers, are mandatory. Pre-biotic molecules are in general complex organic molecules (COMs) that are expected to play an important role in the development of life, and for this they are considered the building blocks of life. The detection of COMs in the gas environment where low- and high-mass stars are forming (known as hot corinos and hot cores, respectively) indicates that they are part of the material of which stars, planets, and comets are made. Therefore, understanding how these COMs are formed is a first and unavoidable step to ascertain how life was able to emerge in the Universe.

The objective of this thesis is to study COMs, such as glycolaldehyde, ethylene glycol, acetic acid, methyl formate, in high-mass star-forming regions observed at high-angular resolution with interferometers at millimeter and submillimeter wavelengths, such as ALMA and VLA. These studies will allow us not only derive the physical properties of young stellar objects, but study the possible formation mechanism of COMs, and in addition, study at very high spatial resolution the kinematics of the gas surrounding high-mass protostars. The expertise achieved by the candidate in calibrating and analyzing large amounts of interferometric line molecular data will be crucial in preparation for the advent of the next generation of interferometers such as SKA.
From the technological point of view, the candidate will be involved in the development of software for SKA.