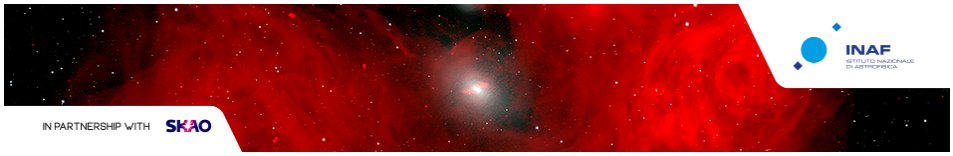

Contribution ID: **161** Type: **not specified**

Astrochemistry of protoplanetary disks on the Solar System scale: living ALMA, preparing SKA

Tuesday 28 November 2023 17:00 (30 minutes)

The ingredients for the recipe to make a habitable planet like our own Earth are: a small rocky planet at the right distance from the host star for water to be in the liquid state, and with an atmosphere organic-rich in volatiles, capable of developing organic molecules chemistry. Searches for exoplanets have shown a large degree of diversity in the planetary systems. It is yet unclear how common a System like our own is. Understanding the formation of planetary systems and the chemical processing that will form their atmospheres is key to understanding the origins of the Solar System. Key questions still to be addressed are: how chemically organic complex are the volatiles delivered to the pristine planetary atmospheres? What molecules are passed from the large-scale envelope to the disk in which planets, comets, and asteroids form? Where do organic complex species form? These are key questions in the context of the SKA WG Cradle of Life.

Astrochemistry of Galactic regions is living a golden age. The study of the so-called interstellar Complex Organic Molecules (iCOMs, mainly O-bearing species with at least 6 atoms), considered the simplest bricks needed to have pre-biotic environments, has benefited of recent improvements of observational tools. The advent of the ALMA (sub-)mm interferometer, with its unique combination of high sensitivity, high angular resolution, and large spectral coverage, boosted both the detections of iCOMs and small C-species and the imaging of their spatial distributions. However, ALMA is unable to survey the chemistry of the protostellar disk midplane where planets will eventually form, because the line emission is absorbed by the optically thick continuum at (sub)mm-wavelengths. In addition, the spectral windows accessible by ALMA do not contain bright lines of heavy molecules (e.g. chains with more than seven C-atoms). Their observations are expected to add an important piece of the overall puzzle as they might have a crucial role in the heritage of organic material from the pre- and proto-stellar phase to the objects of the newly formed planetary system, like asteroids and comets. Those are limits of the ALMA datasets that further sub-mm observations will never overcome. Only high spatial resolution (< 10 au) observations at much lower frequencies, at cm wavelengths, where the dust continuum is more likely to be optically thin, will be able to provide the answer.

Reasearch area

Cradle of Life

Author: CODELLA, Claudio (Istituto Nazionale di Astrofisica (INAF))

Presenter: CODELLA, Claudio (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Plenary - Scientific Highlights on the Pathway to the SKAO