GENESIS-SKA

(GEneral conNditions in Early planetary Systems for the rISe of life with SKA)

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Context and goals of GENESIS-SKA in a nutshell

The recipe to make a habitable planet like our own Earth requires a relatively small rocky planet, at the right distance from the host star, with a not too thick atmosphere rich in volatiles and capable of developing complex organic chemistry. The GENESIS-SKA project, supported as PRIN-INAF, is carrying on studies of planet formation, and pre-biotic chemical complexity (interstellar complex organic molecules, the so-called iCOMs, i.e. C-species with at least 6 atoms, as well as large C-chains), in the context of preparation of SKA Key Programmes. More specifically, we are featuring synergies between astronomical observational and modeling efforts, laboratory experiments, and quantum-chemical computations. The SKA telescope will allow us (i) to study in detail the evolution of dust as it evolves into planetesimals and rocky planets and (ii) to detect heavy complex organic molecules that today are beyond the reach of our observing capabilities.

Planet formation:

- to expand the detailed study of individual systems,

- to derive a consistent and robust scenario for these very early phases of formation of substellar companions from circumstellar discs,

- to prepare dedicated SKA campaigns, and to obtain statistically significant samples to be compared with models of planet formation.

Astrochemistry:

- how chemically complex are the volatiles delivered on the pristine planetary atmospheres?

- What molecules are passed from the large-scale envelope to the disk in which planets, comets, and asteroids form?

- to use emission/absorption lines due to complex organics to shed light on the kinematical components associated with a protostar, otherwise not observable using standard simpler tracers.

Laboratory:

- Studies of chemical and physical properties of dust in driving the synthesis and degradation of prebiotic biomolecules in space-simulated conditions;

- Studies of atom irradiation on carbonaceous grain surface at different temperatures;

- Studies of the effects of ion bombardment on nitrogen-bearing ice mixtures to investigate the formation of complex organic molecules which contain nitrogen;

- Studies of the effects of UV and X-ray irradiation of interstellar ice analogs of different composition;

- numerical simulations of iCOMs synthesis in space

Outreach:

- to communicate more broadly the INAF research activities and the motivations for building the SKA observatory in a way easily accessible to the public;

- to organise talks and conferences and with the production of original dedicated material for schools, exhibitions and public events;

- to work in synergy and will enhance the products of the INAF central outreach offices for the greater benefit of INAF as a whole.