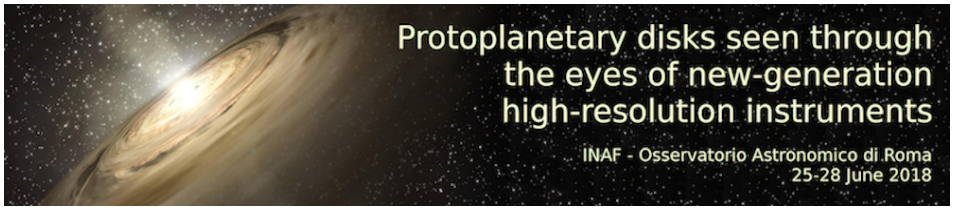

Contribution ID: **3** Type: **Talk**

Protostars: Forges of cosmic rays? (I)

Monday, 25 June 2018 17:00 (30 minutes)

It is largely accepted that Galactic cosmic rays, which pervade the interstellar medium, originate by means of shock waves in supernova remnants. Cosmic rays activate the rich chemistry that is observed in a molecular cloud and they also regulate its collapse timescale, determining the efficiency of star and planet formation, but they cannot penetrate up to the densest part of a molecular cloud, where the formation of stars is expected, because of energy loss processes and magnetic field deflections. Recently, observations towards young protostellar systems showed a surprisingly high value of the ionisation rate, the main indicator of the presence of cosmic rays in molecular cloud. Synchrotron emission, the typical feature of relativistic electrons, has been also detected towards the bow shock of a T Tauri star. Nevertheless, the origin of these signatures peculiar to accelerated particles is still puzzling. Here we show that particle acceleration can be driven by shock waves occurring in protostars through the diffusive shock acceleration mechanism. We find that shocks in protostellar jets and on the protostellar surface can be strong accelerators of thermal particles, which can be easily boosted up to relativistic energies. Our results demonstrate the possibility of accelerating particles during the early phase of a proto-Solar-like system and can be used as the argument to support available observations. The existence of an internal source of energetic particles can have a strong and unforeseen impact over the stellar and planet formation process as well as on the formation of pre-biotic molecules. Finally, I will discuss the challenges for current and future telescopes such as ALMA, SKA, and CTA.

Primary authors: PADOVANI, Marco (Istituto Nazionale di Astrofisica (INAF)); Dr MARCOWITH, Alexandre (Laboratoire Univers et Particules de Montpellier, France); Dr HENNEBELLE, Patrick (CEA, IRFU, SAp, Centre de Saclay, Gif-Sur-Yvette, France); Dr FERRIÈRE, Katia (IRAP, Université de Toulouse, France)

Presenter: PADOVANI, Marco (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Formation of protostellar disks and jets (chair S. Antoniucci)