Cosmic Rays and their Interstellar environment: CRISM

Montpellier Polytech université Montpellier II, June 26th-July 1st, 2011

Scientific Organizing Committee

Andrei Bykov (Ioffe Institute Saint Petersburg Russia),
Katia Ferrière (Institut de Recherche en Astrophysique et Planétologie Toulouse France),
Yves Gallant (Laboratoire Univers et Particules de Montpellier France)
Daniele Galli (Osservatorio Astronomico di Arcteri Italy)
Patrick Hennebelle (Laboratoire d'Etude du Rayonnement et de la Matire en Astrophysique Paris France)
Alexandre Marcowith (Laboratoire Univers et Particules de Montpellier France), chair
Thierry Montmerle (Institut d'Astrophysique de Paris France).

Local Organizing Committee

Fabio Acero, Sylviane Colaiocco, Johann Cohen-Tanugi, Michèle Delpont, Fabrice Feinstein, Yves Gallant, Alexandre Marcowith, Fabrice Martins, Carole Prévot, Dahbia Talbi, Matthieu Renaud.

Sponsorhip

Centre National de la Recherche Scientifique (IN2P3, INSU, GDR PCHE, PN PCMI), Université Montpellier II, région Languedoc-Roussillion

FOREWORD

A.Marcowith[1], A.Bykov, K.Ferrière, T.Montmerle editors

The workshop Cosmic Rays and their Interstellar Environment (CRISM) is the second workshop dedicated to cosmic ray (CR) physics after a first one organised by the "Laboratoire Univers et Particules de Montpellier" (former LPTA) in September, 2009. While the latter was more focused on the physics of shock-molecular cloud interactions, the last workshop aims at giving a broader overview of the general impact of CRs on the interstellar medium (ISM). CRs are indeed a major component of the ISM. They have an energy density equivalent to the magnetic field and the interstellar gas. GeV CRs probably take an active part in the dynamics of the structures of the ISM. MeV CRs contribute to its ionisation and heating. They generate plasma waves and magnetic turbulence. This turbulence has in turn a key role in the evolution of molecular clouds and in the star formation cycle. At high energies CRs manifest themselves through their interaction with the molecular gas and produce neutral and charged pions and secondary particles (gamma rays, electron-positron pairs and possibly neutrinos). CRs are also responsible for the spallation nucleosynthesis of light either stable or radioactive elements. CRs are likely produced at supernova shocks. Since most supernovae result from the core collapse of massive stars, the evolution of these stars and the way they shape their interstellar environment must play a key role in cosmic ray production. But only very recently has this component started to be integrated in modelling of the ISM evolution. The main objective of this international workshop is to contribute to a better account of the multiple effects of this energetic component of the ISM.

These proceedings are divided in four main parts. *Multi-wavelength observations of CR sources and CR physics:* reviews of recent observations at high energy (gamma and X-ray) especially by the Cherenkov telescopes (HESS, MAGIC, Veritas and CTA) and Fermi. Then we will present surveys in radio observations of supernova remnant (SNR) shells and probes of the interaction of SNR with molecular clouds. We will further cover the last developments in theory of particle acceleration in SNR and massive star forming regions as well as the cosmic-ray escape and interaction with molecular clouds. Some reviews address the connection between pre-supernova phases and particle acceleration efficiency and the production of the all cosmic-ray spectrum. *The survey of the properties of the ISM*: State-of-the-art properties of the ISM, its magnetic field structure, properties of the interstellar turbulence. Hence we will present recent progresses in numerical modelling of the turbulent ISM and the interplay between CRs, magnetic fields and the gas component. *Cosmic-ray propagation and interaction in the ISM:* Recent reviews of direct observations and models of cosmic-ray propagation (at both high energy TeV-PeV and low particle energy (MeV-GeV) ends. *Effect of cosmic-ray ionisation on the ISM:* production of ionic species important for the interstellar chemistry, effects on the gravitational collapse of molecular clouds, possible effects of CRs on Earth climate.

---

[1] Requests should be addressed to Alexandre.Marcowith@univ-montp2.fr