Exploring the gamma-ray sky: binaries, microquasars and their impact on understanding particle acceleration, relativistic winds and accretion/ejection phenomena in cosmic sources

De 2008-07-01 à 2013-06-30, projet clôturé

Objectif

The most energetic photons in the universe are produced by poorly known processes, typically in the vicinity of neutron stars or black holes. The past couple of years have seen an increase in the number of known sources of very high energy gamma-ray radiation from a handful to almost 50, thanks to the European collaborations HESS and MAGIC. Many of those sources are pulsar wind nebulae, supernova remnants or active galactic nuclei. HESS and MAGIC have also discovered gamma-ray emission from binary systems, finding that some emit most of their radiation at the highest energies. Expectations are running high with the December launch of the GLAST space telescope which will provide daily all-sky information in high energy gamma-rays with a sensitivity comparable to that achieved in years by its predecessor. I propose to explore the exciting observational opportunities in high energy gamma-ray astronomy with an emphasis on non-thermal emission from compact binary sources. Binary systems are intriguing new laboratories to understand how particle acceleration works in cosmic sources. The physics of gamma-ray emitting binary systems is related to that in pulsar wind nebulae or in active galactic nuclei. High energy gamma-ray emission is the result of non-thermal, out-of-equilibrium processes that challenge our intuitions built upon everyday phenomena. The particles are billions of times more energetic than X-rays and can reach energies greater than those in particle accelerators. Binary systems offer a novel, constrained environment to study how the cosmic rays that pervade our Galaxy are accelerated and how non-thermal emission is related to the formation of relativistic jets from black holes (accretion/ejection). The study requires a combination of skills in multiwavelength observations, interdisciplinary experience with gamma-ray observational techniques originating from particle physics, and theoretical know-how in accretion and high energy phenomena.

Informations connexes

Résultat en bref

The enigmatic gamma-ray binaries

Résumés de rapport

Final Report Summary - GAMMARAYBINARIES (Exploring the gamma-ray sky: binaries, microquasars and their impact on understanding particle acceleration, relativistic winds and accretion/ejection phenomena in cosmic sources.)
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