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Short Gamma-Ray Bursts: situation and future perspectives

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After 15 years of Swift observations, the knowledge of the class of short GRBs experienced an impressive boost. The discovery of short GRB afterglows in 2005, provided the first insight into their energy scale, environments and host galaxies. The lack of detection of associated supernovae proved that their progenitors are not massive stars. The spectacular detection of the first electromagnetic counterpart of a gravitational wave event detected by the LIGO/Virgo interferometers and originated by the coalescence of a double neutron star system (GW 170817) marked the dawn of a new era for astronomy. The short GRB 170817A associated to the GW event provided the long-sought evidence that at least a fraction of short GRBs are originated by NS-NS merging and suggested the intriguing possibility that relativistic jets can be launched in the process of a NS-NS merger. The extensive follow-up campaign carried out at all wavelengths over almost three years of GRB 170817A probed the GRB emission geometry, providing clear evidence for a successful jet endowed with an angular energy profile, featuring a narrow and energetic core (seen off-axis), surrounded by a slower, less energetic layer/sheath/cocoon. Besides the remarkable event associated to GW 170817, kilonova signatures have been tentatively identified in other short GRBs light curves, supporting a scenario where kilonovae are ubiquitous and can probe neutron star mergers well beyond the horizon of the gravitational wave detectors.
In this talk I will provide an overview of the observational properties of short GRBs and kilonovae, showing how the study of correlations and carefully selected samples of events can provide a useful tool to unveil the properties (progenitors, central engine, emission geometry, environment) of these elusive events.

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