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The kilonova - short GRB connection in the Multi-Messenger era

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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 wealth of data collected provided the first compelling observational evidence for the existence of "kilonovae", i.e. the emission due to radioactive decay of heavy nuclei produced through rapid neutron capture. 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 a few 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 review the situation and perspectives of our understanding of short GRBs (progenitors, central engine, emission geometry, environment) and kilonovae in the multi-messenger era.

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