The era of collaborative multi-wavelength and multi-messenger astronomy: science and technology



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Optical surveys in the multi-messenger era

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In the last decade a new generation of optical surveys have increased the number of transient detections by order of magnitudes. The combination of wider field of view and more frequent temporal sampling, led to the discovery of new class of events which often are labeled unusual, peculiar, extraordinary, etc. We may suspect that the designation reflects our ignorance of the astrophysical mechanism that originates the transients. In many cases, multi-wavelength analysis revealed that the shock of fast expanding ejecta with pre-existing circumstellar medium is shaping the electromagnetic display and hiding the central engine.

In this context, gravitation waves are a new messenger that probes otherwise unaccessible physical quantities. The potential of the new multi-messenger astrophysics has been demonstrated by the first joined observations of August 2017 and motivated a major effort by the astronomical community to guaranty that all new opportunities are exploited.

At the same time, some of the findings of current GW searches are challenging our understanding of the formation of compact remnants and in turn are prompting for a close look to the final fate of massive stars.

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