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Multi-messenger Transient Astrophysics with very-high energy gamma rays

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When a cataclysmic event takes place in the Universe, like the coalescence of compact objects like neutron stars or black holes, it is unveiled through a variety of waves and rays emanating from it. These are considered as messengers that can be detected on Earth through different observatories. Each one of these emissions is a signature of a particular physical phenomenon that is taking place. For example, very-high energy gamma rays can probe cosmic ray acceleration processes at the site of the merger. A cosmic event like the merger of two compact objects has a multi-messenger aspect since it can potentially emit electromagnetic waves, gravitational waves, neutrinos, and cosmic rays with different information carried out by each type of messenger. The emitted messengers are characterized by their transient aspect, since they appear suddenly and show important variability through time.

In my contribution on Multi-messenger Transient Astrophysics, I explain how the combination of information from different messengers can help to better understand cosmic physical phenomena and study special sources. From my position in the H.E.S.S. collaboration, an array of Imaging Atmospheric Cherenkov Telescope dedicated to the study of photons in the GeV to TeV range, I present new methods to hunt multi-messenger transient events. I also present different analysis allowing to uncover the mystery behind non-thermal phenomena, concentrating my search on gravitational waves events, gamma ray bursts and Fast Radio Bursts. Finally, I show the results of observations of some particular events like the GW170817 binary neutron star merger and the GW170814 binary black hole merger. I also reveal details of recent studies on some particular Fast Radio Bursts and on some sources like SGR1935+2154 that recently triggered the interest of the astronomical society.

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