APC colloquium

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Amphithéâtre
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Hard X-ray counterparts of multi-messenger transients

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Recently emergence of rapid optical and radio surveys accelerated development of time domain astronomy. Furthermore, observations of gravitational waves and neutrinos enabled breakthrough multi-messenger observations of fundamental physical processes in space. Short and energetic events are generally easier to separate from the background than persistent sources, and this is why the first truly multi-messenger signals were also detected as transient events.

The properties or even the nature of these new transient sources often remain uncertain, but it appears as they are typically associated with peculiar supernovae, mergers of compact objects, or tidal disruption events. An important perspective on these events is given by hard X-ray and gamma-ray emission: it tends to reveal a distinct emission component that points to the most dense and energetic regions at the heart of the source.

I will highlight recent pioneering observations of short energetic transients made with INTEGRAL, which is especially well-equipped to observe unpredictable, short-lived, and energetic hard X-ray and gamma-ray transients. It carries a collection of detectors that monitor the entire hard X-ray sky with over 80% duty cycle and are able to re-point to perform deep and sensitive hard X-ray observations of a large selected sky region.
I will begin by discussing the observations of gamma-ray bursts, in particular in association with the gravitational wave events and high-energy neutrinos. Then, I will review how INTEGRAL observations of fast hard X-ray transients helps to reveal mechanisms at the core of the some of short energetic transients likely associated with the deaths of the massive stars. Finally, I will discuss how the recent discoveries in the domain of multi-messenger transients were made possible by a global effort to achieve a new degree of automation and interoperability.