(Talk)
Impact of gravitational waves emitted by inspiralling binary black holes on their accretion structure

The many recent detections of gravitational waves (GWs) of binary black hole (BBHs) mergers have opened the way for future multimessenger compaigns. One expected result is the co-detection of electromagnetic (EM) radiation from a BBH merger system together with its GW inspiral emission, detectable for stellar-mass BHs with LIGO/Virgo, intermediate-mass BHs (and stellar-mass BHs) with the ET and supermassive BHs with the space-based detector LISA in 2030+. However, the EM signatures of such systems are not firmly identified because few numerical codes are able to model the gravitational impact of the BBH on its accretion disk in General Relativity (GR). Furthermore, the direct impact of the GW on the BBH accretion structure has never been studied.

In this talk, I will present results from e-NOVAs (extended Numerical Observatory for Violent Accreting systems), the first French (and European) code to evolve an analytical BBH metric as it solves the equations of GR-magnetohydrodynamics and to compute synthetic observations in the same metric via GR ray-tracing. Using e-NOVAs, I will study the influence of a BBH in the inspiral regime on their circumbinary disk. More specifically, and for the first time, I will show how the GWs emitted during (and allowing) the inspiral phase of the BBH perturb the density and velocity fields of the circumbinary disk beyond a gravitational wavelength. I will discuss whether this impact has the potential to lead to observable features and, if so, the influence of the binary parameters.