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Constraining core-collapse supernova engine with Einstein Telescope

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Till date ~200 compact binaries have been detected with the current gravitational wave (GW) detectors. This number is expected to increase by orders of magnitude in the 3G detector era.
In Singh et al 2020 and 2024, we have shown that with just ET as a single instrument, the mass distributions and the merger rate densities of compact binaries will have much better constraints.
The constraints will be strong enough to allow us to distinguish between different populations such as Population I+II, Population III, and globular cluster compact binaries.
One of the key elements which affect the binary merger rates is dynamics of the engine behind core-collapse supernovae and the fate of the stellar collapse of a massive star.
It has been shown recently by Olejak et al 2022 that timescale of convection growth may have a large effect on the strength of SN explosion and therefore also on the mass distribution of stellar remnants.
In this talk I will discuss the prospect of constraining the uncertainties in the convection growth time with Einstein telescope by inferring the constraints on the merger rate density evolution of the compact binaries.

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