Contribution ID: **26** Type: **Presentation**

Gravitational wave signal of protoneutron star convection

Tuesday 22 July 2025 14:40 (20 minutes)

Gravitational waves offer a direct way to probe the explosion mechanism of core-collapse supernovae and proto-neutron star turbulence. By combining state-of-the-art 3D-MHD convection simulations with physics-informed scaling laws, we generate synthetic GW spectrograms up to 7 seconds post-bounce—much longer than what is typically achieved with global core-collapse models. We examine how the GW signal from proto-neutron star convection is affected by both rotation and dynamo-generated magnetic fields and estimate its detection horizon with current and future ground-based detectors, such as the Einstein Telescope.

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Session Classification: Theory