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Empirical Mode Decomposition for CCSN multi-messenger studies

Core Collapse Supernovae (CCSNe) are among the most energetic astrophysical events in the Universe. Despite huge efforts on understanding the main ingredients triggering such explosions, we still lack of compelling evidences for the precise mechanism driving those phenomena. CCSNe are expected to produce Gravitational Waves (GWs) due to asymmetric mass motions in the collapsing core, and emit in the meanwhile neutrinos as a result of the interactions in their high-density environment. GWs and neutrinos can provide a unique probe to study the inner engine of these processes. Among all the possible detectable signature from CCSNe, there is one, Standing Accretion Shock Instabilities (SASI), that links the gravitational wave emission with the outcoming neutrino flux. In this work, (Embedded) Empirical Mode Decomposition has been applied to decompose a set of GW timeseries, taken from a selected sample of 3D numerical simulations. This approach allows to identify SASI contribution and its instantaneous frequency.

Collaboration(s)

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