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Supernova detection study; Investigation of progenitor core rotation with Gravitational Wave and Neutrino detector.

Core-collapse supernova is one of the most energetic phenomenon in the universe and when it happens in our galaxy,
various detectors would detect gravitational waves (GWs) and neutrinos.
Current numerical simulations of supernova explosion are succeeded to introduce multi-dimensional effects, SASI and asymmetric convection.
But the explosion mechanism is not understood well.
One of the main key point to understand is the identification of the progenitor star core conditions(ex: mass, mass density profile, rotation rate).
By using a consistent model for both GW and neutrino, we are discussing how supernova signals are observed, especially focusing on the time correlation variation between GW waveform and electron neutrinos/anti-electron neutrinos flux.
The GW detector is assumed to advanced detectors, mainly based on KAGRA detector
which is the 3km laser interferometric detector located in Kamioka mine.
The neutrino detector is assumed to EGADS detector, which is 200 ton water Cherenkov detector with 0.1% Gd loading.
The characteristics of EGADS detector is the 90% neutron capture probability,
which can identify observed event as from inverse beta decay or other interactions.
We devised the method of extraction of the start time of GW emitting, t_start_gw and the neutronization burst time, t_nburst.
And to compare them, we calculated the possibility of progenitor core is rotated or not from observation.
Our simulation results show that we can judge about 100% no core rotation for the no core rotation model, and about 90% core rotation for the strong core rotation model when the close supernova(<1kpc) is occurred.

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