Hydrodynamic processes of asymmetric collapsing supernova explosion with rotation

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Hydrodynamic processes, by which the collapse of stellar core triggers the supernovae explosion, were studied in detail by solving numerically an axially symmetric problem taking into account fast initial rotation of the iron core [1]–[4]. Simulations showed the propagation of a strong diverging shock wave with a large asymmetry of the explosion and with a total post-shock energy comparable to the characteristic energies of observed supernovae. Physical background for the formulation of the problems under consideration is provided by the rotational explosion scenario for collapsing supernovae. According to this scenario, supernovae explosion is preceded by the formation of a compact binary system of neutron stars through the fragmentation of a rapidly rotating preneutron star. Such neutron star binary evolves to the point of explosion due to the losses of energy and angular momentum via the emission of gravitational waves in the presence of uniform or toroidal atmosphere – another remnant of iron core collapse.

References

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