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Construction and verification of analytical approximation of nonequilibrium neutrino distribution function in core-collapse supernova

The local nonequilibrium neutrino distribution function in a core-collapse supernova is considered and two variants of its analytical approximation are suggested. The proposed analytical approximations are verified using the results of a one-dimensional simulation of neutrino propagation, performed selfconsistently with hydrodynamics in Prometheus-Vertex code. It was shown that the approximation, based on a nominal Fermi-Dirac distribution of neutrino spectrum, agrees with results of Prometheus-Vertex simulation only in the inner parts of the supernova. Whereas the approximation based on alpha-fit of neutrino energy distribution, also known as Gamma-distribution, is more general and has no restrictions for application in any part of the supernova. The obtained results could be applied for estimation of various neutrino effects in supernova conditions without their direct inclusion in the explosion simulation. The work is supported by the Russian Science Foundation (Grant No. 18-72-10070).

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Collaboration / Activity

No

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