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Transport coefficients of dense nucleon matter at low temperature

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The transport properties of dense nucleon matter at low temperatures are important but have rarely been studied in nuclear physics and astrophysics. In this work, we present a primary study of both bulk and shear viscosities of dense nucleon matter within the framework of the Boltzmann equation. To describe the static properties of nucleon matter, we apply the Walecka model in the mean-field approximation, where we also estimate the relaxation time. Our results indicate that, at linear order in scattering, the relaxation time is proportional to the quasi-Fermi momentum divided by the square of the temperature. The fluid properties are characterized by shear and bulk viscosities proportional to the quasi-Fermi momentum over the enthalpy, with the bulk viscosity being approximately twice the shear viscosity due to its higher sensitivity to interactions.

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