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Nuclear kinetic density from ab initio theory

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The nuclear kinetic density is a fundamental, non-observable quantity in density functional theory (DFT) dependent on the nonlocal nuclear density. With the ability to compute the nonlocal nuclear density in the ab initio no-core shell model approach (NCSM), we may provide insights about nuclear structure by comparing center of mass (COM) removal procedures, which can improve the precision of density functionals. We derive the kinetic density from the nonlocal one-body nuclear density computed in the NCSM. We construct translational invariance in our nuclear density, and hence kinetic density, by exactly removing the spurious COM component from the NCSM eigenstates expanded in the harmonic oscillator (HO) basis. The ground state nonlocal nuclear density and kinetic density of ^{4,8}He, ^{12}C, and ^{16}O are calculated to display the effects of COM removal on predicted nuclear structure. The results of this work have been published in Phys. Rev. C 99, 024305 (2019).

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