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A variational Monte Carlo approach for the study of medium-mass nuclei[1] DIEGO LONARDONI, STEVEN C. PIEPER, ROBERT B. WIRINGA, ALESSANDRO LOVATO, Argonne Natl Lab — We report on an accurate variational many-body technique (cluster variational Monte Carlo) suitable for the study of medium-mass nuclei. The employed many-body nuclear Hamiltonian contains realistic two- and three-nucleon interactions and the trial wave function is constructed from pair- and triplet-correlation operators acting on a product of single-particle determinants. As opposed to traditional variational Monte Carlo calculations, that are limited to $A = 12$ nuclei, expectation values are evaluated with a cluster expansion for the non-central correlations. The cluster expansion drastically reduces the computational effort necessary for the study of an A-body system, allowing us to extend the calculations in the medium-mass region, currently up to 40 nucleons. We present results for the closed-shell nuclei ^{16}O and ^{40}Ca and prospects for open-shell nuclei like ^{40}Ar. Of particular interest is the derivation of the momentum distributions that can be used to constrain the spectral functions of these nuclei. This has a crucial interplay with electron-nucleon and neutrino-nucleon scattering experiments, where Argon is among the typical targets and the scattering data at high momentum transfer can be analyzed by means of the spectral function formalism.

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