Abstract Submitted
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Decoupling of bound states with the Magnus expansion and the in-medium similarity renormalization group.[1] ANTHONY TROPIANO, Ohio State University and Michigan State University, SCOTT BOGNER, Michigan State University, RICHARD FURNSTAHL, NATHAN PARZUCHOWSKI, Ohio State University — The coupling of high- and low-momentum modes in nuclear Hamiltonians complicates ab initio nuclear structure calculations. The in-medium similarity renormalization group (IM-SRG) softens nucleon-nucleon interactions by applying a continuous unitary transformation to the Hamiltonian to decouple low- and high-momentum scales. Here we study differences between evolving nuclear Hamiltonians with the typical IM-SRG approach and with the implementation of the Magnus expansion by applying these approaches to a leading-order nucleon-nucleon potential in momentum space that features a spurious, deep bound state at higher chiral effective field theory cutoffs. We consider both the Wegner and Wilson SRG generators. We find that the Magnus implementation converges to the typical SRG approach. With the Wegner SRG generator, the Magnus expansion can be used to soften nuclear potentials without shifting deeply bound states in the low-energy scale, and the SRG flow equations can be solved with a crude ODE solver without loss of accuracy in the eigenvalues of the evolved operator.

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