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Similarity renormalization group to the many-body problems KOSHIROH TSUKIYAMA, Department of Physics, The University of Tokyo, SCOTT BOGNER, NSCL, MSU, ACHIM SCHWENK, TRIUMF — One of the major goals of nuclear structure theory is to explain many-body phenomena from nucleonic interactions. Since realistic nucleon-nucleon interactions have strong repulsion and tensor component at short distance, nuclear system is non-perturbative and even few-body problems are difficult to solve. Several methods based on renormalization group (RG) or unitary transformation can be used to treat the short-range correlation, the consequence of which nuclear many-body calculations converge rapidly. These methods, however, generate many-body forces which significantly affects the observable unless the induced forces are treated properly. To overcome this problem, one way is to keep the induced many-body forces explicitly. We propose an alternative way, In-medium similarity renormalization group (SRG), by extending the free-space SRG. We derive the flow equations for normal-ordered Hamiltonian assuming a core so that the dominant part of many-body correlations are incorporated into density dependent lower-body forces, driving the Hamiltonian more feasible form for the many-body calculations. In-medium SRG provides a new systematic and non-perturbative path from nucleonic interactions to the many-body calculations. We will show the newest results of the methods.

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