Roth and Navrátil Reply: In the preceding Comment [1] Dean *et al.* criticize our calculations for the ground-state energy of ^{40}Ca within the importance-truncated no-core shell model (NCSM) [2]. In particular, they address the role of configurations beyond the $3p3h$ level, which have not been included in our ^{40}Ca calculations for large model spaces.

Before responding to this point, the following general statements are in order. For the atomic nucleus as a self-bound system, translational invariance is an important symmetry. The only possibility to preserve translational invariance when working with a Slater determinant basis is to (i) use the harmonic oscillator (HO) single-particle states and (ii) truncate the model space according to the total HO excitation energy $N_{\max}\hbar\Omega$, as done in the *ab initio* NCSM. This is important not only for obtaining proper binding or excitation energies, but also for a correct extraction of physical wave functions.

The minimal violation of the translational invariance was one of the main motivations for developing the importance-truncation scheme introduced in [2]. In this scheme, we start with the complete $N_{\max}\hbar\Omega$ HO model space and select important configurations via perturbation theory. All symmetries are under control and our importance-truncated NCSM calculations are completely variational, i.e., they provide an upper bound for the ground-state energy of the system.

The restriction to the $3p3h$ level, made for computational reasons in the $N_{\max} > 8$ calculations for ^{40}Ca, is not inherent to the importance-truncation scheme. The explicit inclusion of $4p4h$ configurations—though computationally more demanding—is straightforward, even for the largest $N_{\max}\hbar\Omega$ model spaces discussed. To demonstrate this we have performed full $4p4h$ calculations for ^{40}Ca in a $14\hbar\Omega$ no-core model space at $\hbar\Omega = 24$ MeV using the $V_{\mathrm{low}k}$ interaction employed in [2]. The resulting ground-state energy of $E_{4p4h} = -471.0$ MeV can be compared with $E_{3p3h} = -461.2$ MeV for the $3p3h$ calculation reported in Fig. 5(b) with an uncertainty of typically 1 MeV due to the extrapolation $\kappa_{\min} \to 0$. Thus the $4p4h$ configurations change the resulting ground-state energy of ^{40}Ca by approximately 2%.

In addition to the explicit inclusion of $4p4h$ or higher-order configurations one can use perturbative corrections based on the eigenstates obtained in the importance truncated space, to account for excluded higher-order configurations. Alternatively, Davidson-type corrections, which are employed successfully in quantum chemistry [3], can be employed. These techniques even restore size extensivity in an approximate way.

The coupled-cluster method (CCM) used by the authors of [1] lacks the above discussed features important for the nuclear many-body problem, in particular, it violates translational invariance from the very beginning and it does not fulfill the variational principle. The problem of a spurious center-of-mass contamination of the many-body states in CCM is not resolved and often not even mentioned (see, e.g., Ref. [4]). In [1] it is stated that the CCM Hamiltonian is translationally invariant. By inspecting Eqs. (4) and (6) in [5], one can see that it is not the case as the parameter β_{CoM} is fine-tuned and thus nonzero in general. Moreover, noniterative triples corrections like CCSD(T), as referred to in [1], tend to overestimate the correlation energy or even collapse. It is claimed that the CCM is very accurate. A closer inspection of recently published nuclear many-body results does not support this statement. In Ref. [6], the ^{4}He binding energy with the chiral nucleon-nucleon (NN) potential was determined with an uncertainty of several MeV. The same is obtained in the *ab initio* NCSM with accuracy of 10 keV [7]. The CCM binding energy results for ^{16}O with the identical chiral N^{3}LO NN potential obtained in Refs. [5,8] differ by more than 5 MeV.

The CCSD(T) ground-state energy for ^{40}Ca with $V_{\mathrm{low}k}$ reported in Ref. [4] is about 30 MeV lower than our $4p4h$ result (CCSD is about 20 MeV lower). Taking into account the small 2% difference of our $3p3h$ and $4p4h$ results and the violation of the variational principle and the translational invariance in the CCM method, we believe that the CCM result overestimates the exact ground-state energy in this case.

In conclusion, the importance truncation provides an efficient way to extend the domain of NCSM calculations to medium-heavy nuclei while preserving translational invariance and the variational principle and allowing for systematic and controlled improvements.

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