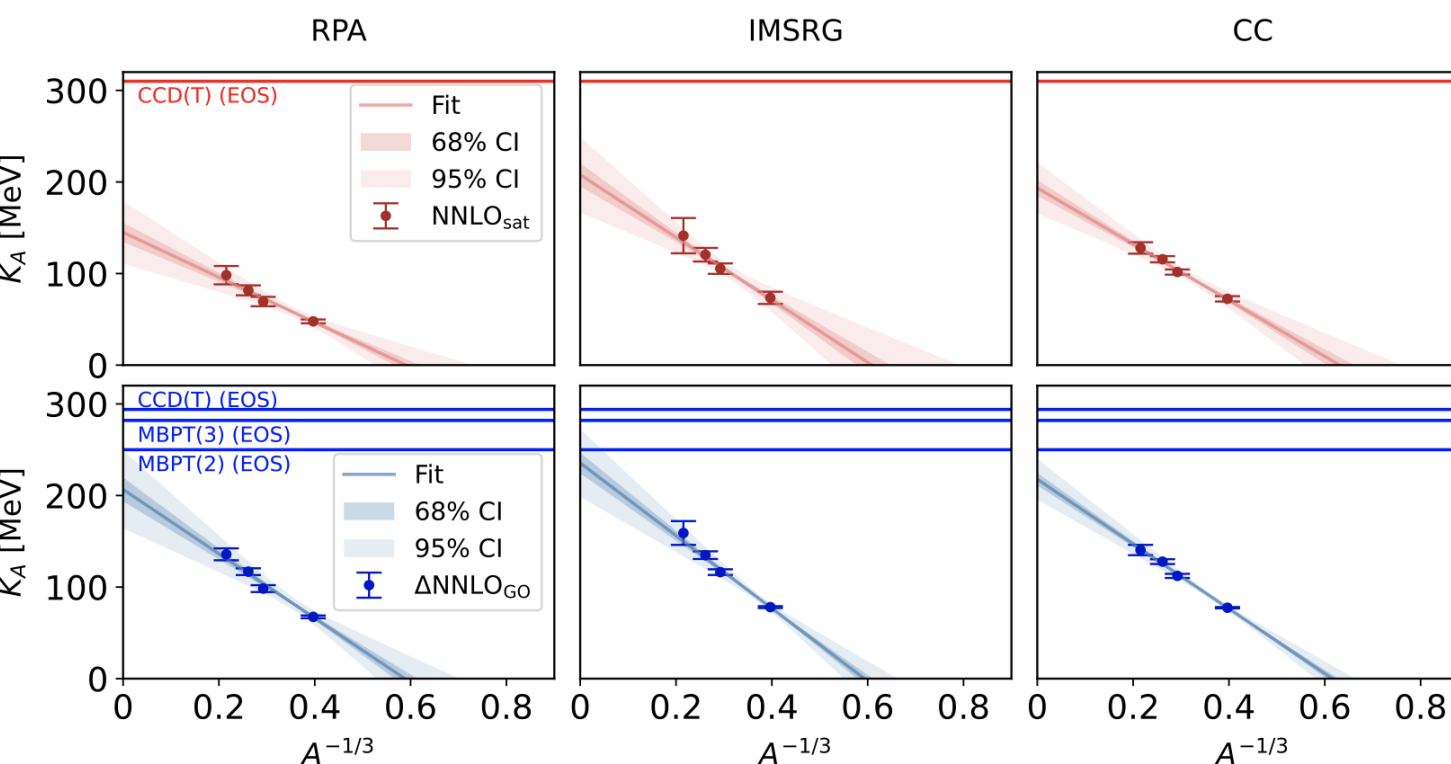


Ab initio calculations of monopole sum rules: From finite nuclei to nuclear matter

Objectives

- Predict moments of the isoscalar monopole response comparing different many-body methods.
- Extract average energies of the monopole response and finite-nucleus incompressibilities.
- Analyze the connection between monopole response properties and the incompressibility of nuclear matter.



Nuclear matter incompressibility extracted from a fit of the finite-nucleus incompressibilities of ^{16}O , ^{40}Ca , ^{56}Ni and ^{100}Sn to a phenomenological formula. The intercept of the linear fit yields the nuclear matter incompressibility, which is compared with results from nuclear matter calculations using the same interaction.

Impact

- We find good agreement between different *ab initio* approaches (coupled-cluster theory and in-medium similarity renormalization group) for properties of the monopole response.
- Mean-field calculations based on the random phase approximation are a good approximation when soft nuclear interactions are used.
- Extrapolated values for the nuclear matter incompressibility are lower than those obtained in nuclear matter calculations, but they are consistent with phenomenological ranges.

Accomplishments (as of now)

- Pre-print: F. Bonaiti, A. Porro, S. Bacca, A. Schwenk and A. Tichai, [arXiv:2511.15836](https://arxiv.org/abs/2511.15836).