

Quantifying alpha clustering in light nuclei from binding energies

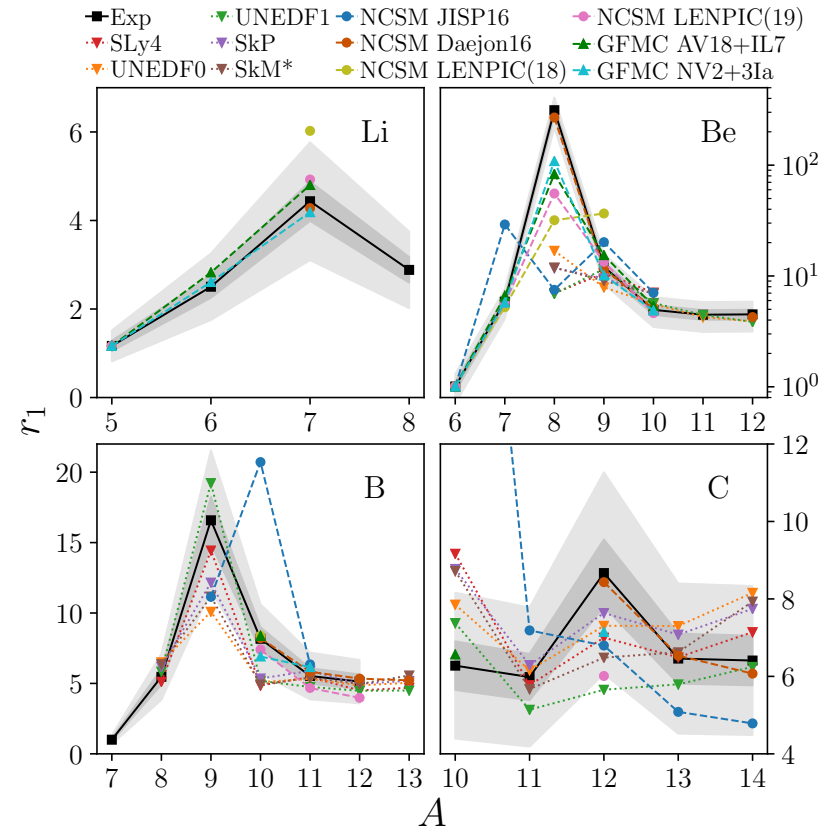
Objectives

- Quantify indirectly the degree of alpha clustering in light nuclei using only the binding energies of their partition subsystems as input.
- Systematically evaluate many-body approaches (ab initio, density functional theory) on alpha clustering.
- Bayesian inference of the uncertainties on energies from the one-alpha clustering measure to identify key nuclei for future improvement of nuclear forces.

Impact

- Most state-of-the-art many-body approaches fail to adequately capture alpha clustering in light nuclei.
- Three-body forces play a critical role.
- Six key nuclei identified: ${}^6_7\text{Li}$, ${}^7\text{Be}$, ${}^{10,11}\text{B}$, and ${}^{11}\text{C}$

Accomplishments



One-alpha clustering measures given by various many-body approaches. Most are not included in the 10% relative uncertainty band on experiment (dark gray).