Very short overview of ab initio results

12 May 2021

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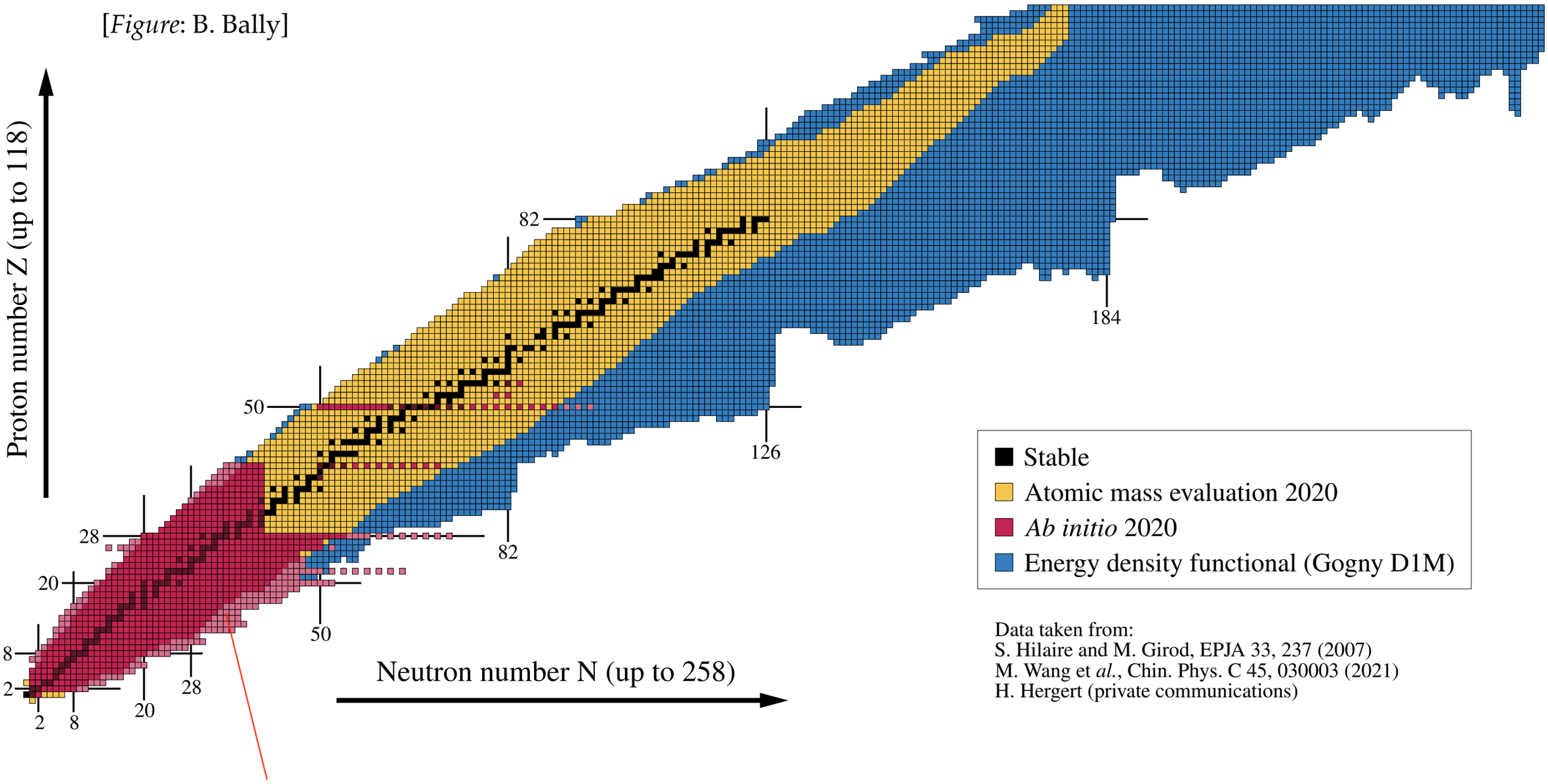
Progress of ab initio calculations

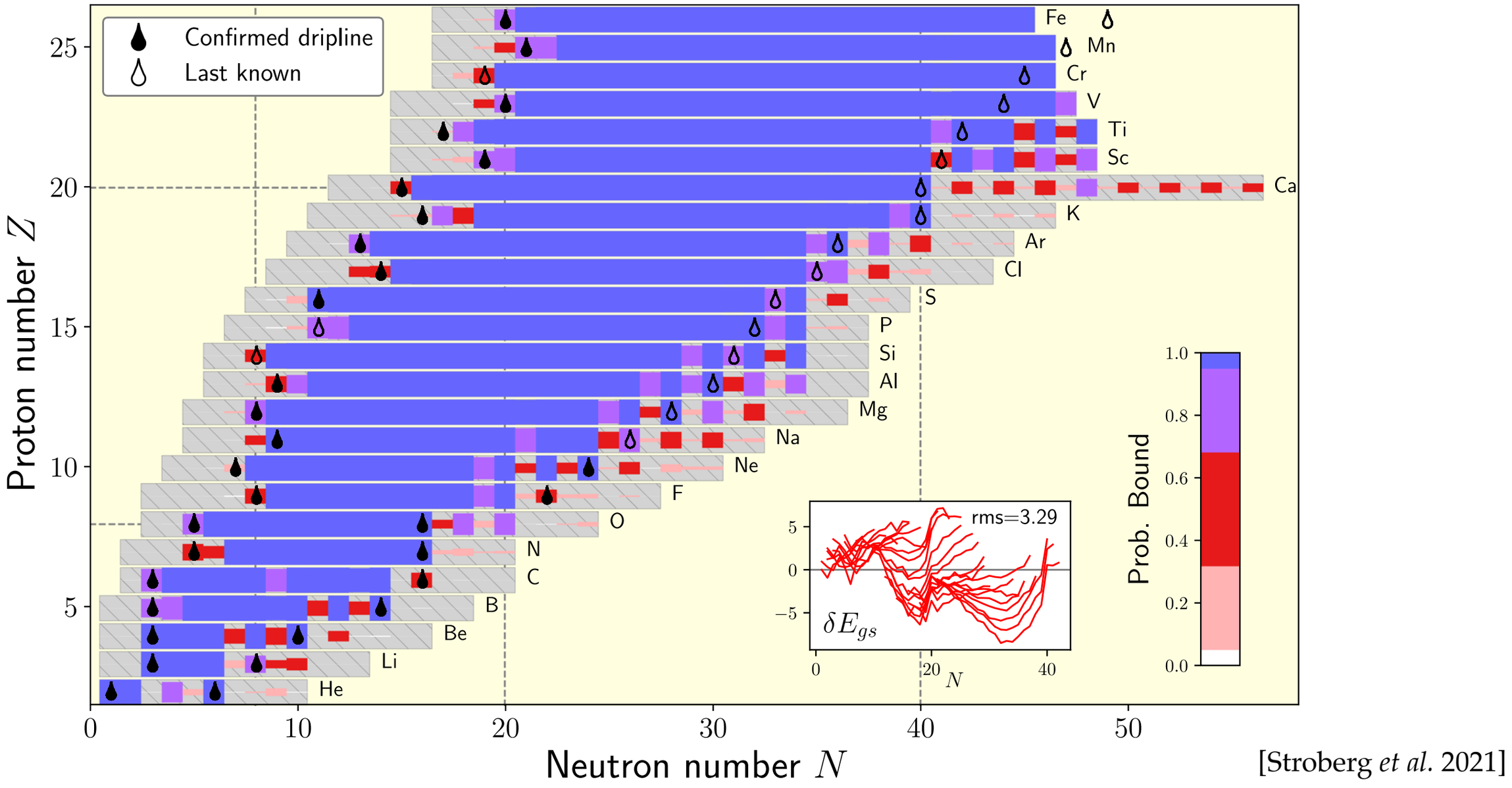
[*Figure*: B. Bally]



Data taken from:
S. Hilaire and M. Girod, EPJA 33, 237 (2007)
M. Wang et *al.*, Chin. Phys. C 45, 030003 (2021)
H. Hergert (private communications)

Ab initio prediction of the drip lines

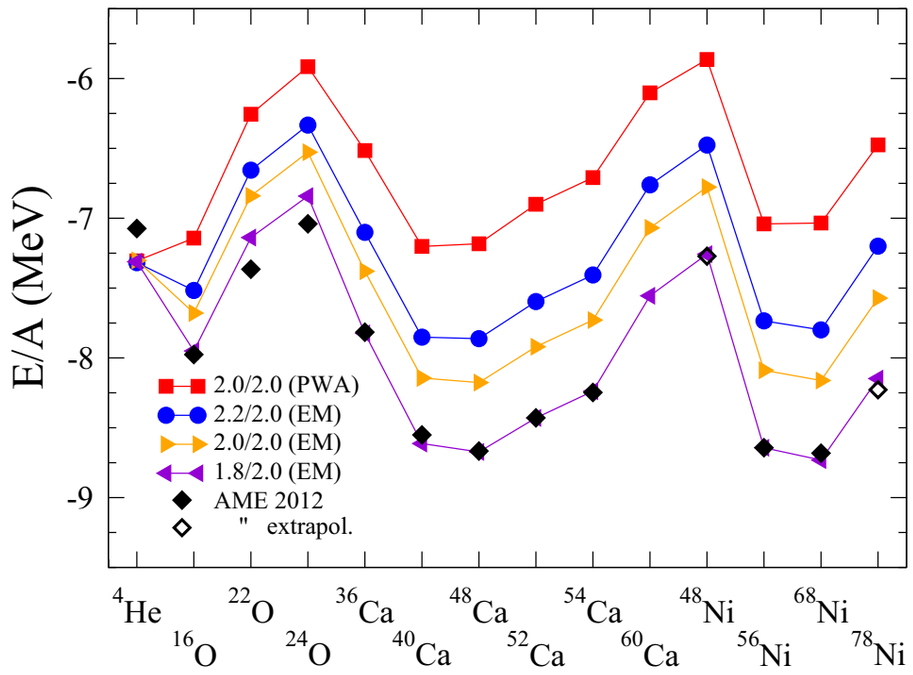
- **Systematic survey of light and medium-mass nuclei** (method: valence-space IMSRG)
  - Good description (+ prediction) of proton and neutron drip lines
  - **Rms deviation** on total binding energies = 3.3 MeV (cf. 0.7 MeV in energy density functionals)

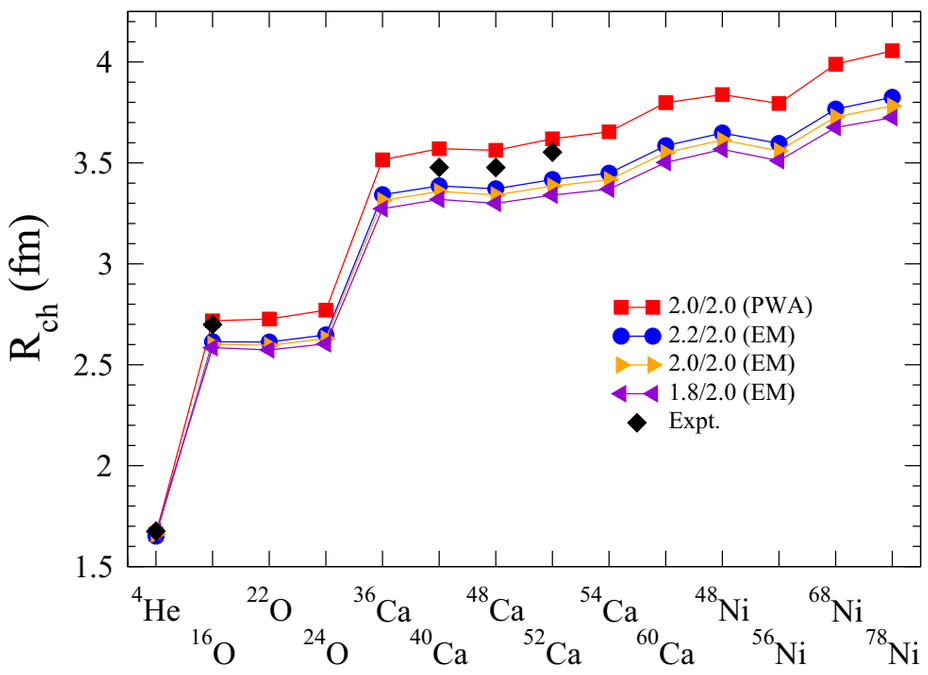


[Stroberg *et al.* 2021]

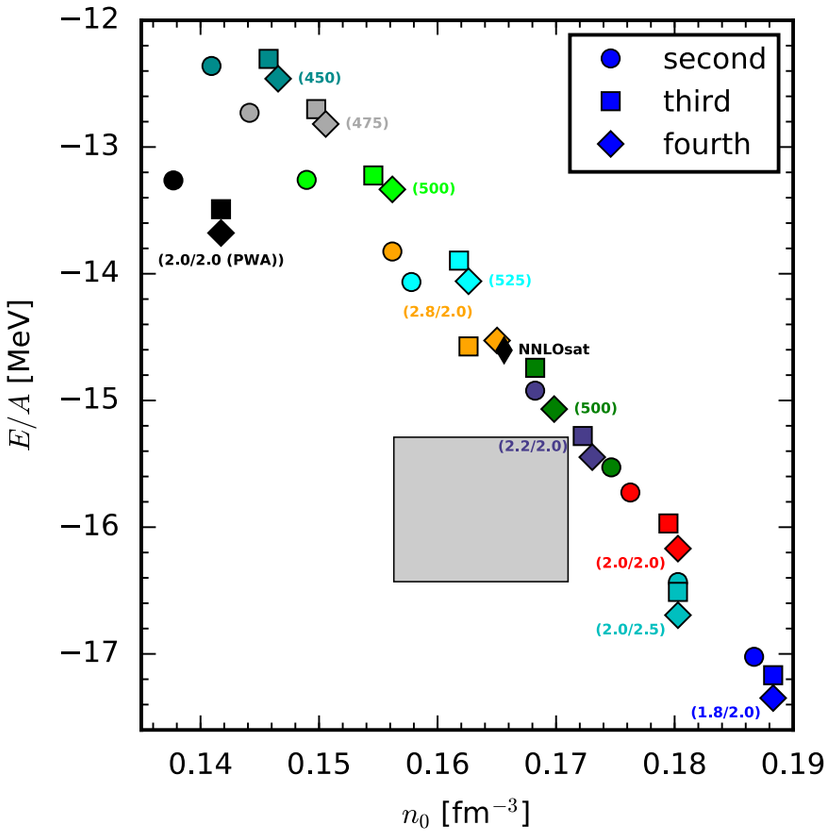
“Magic” interaction & proliferation of Hamiltonians

[Simonis *et al.* 2017]





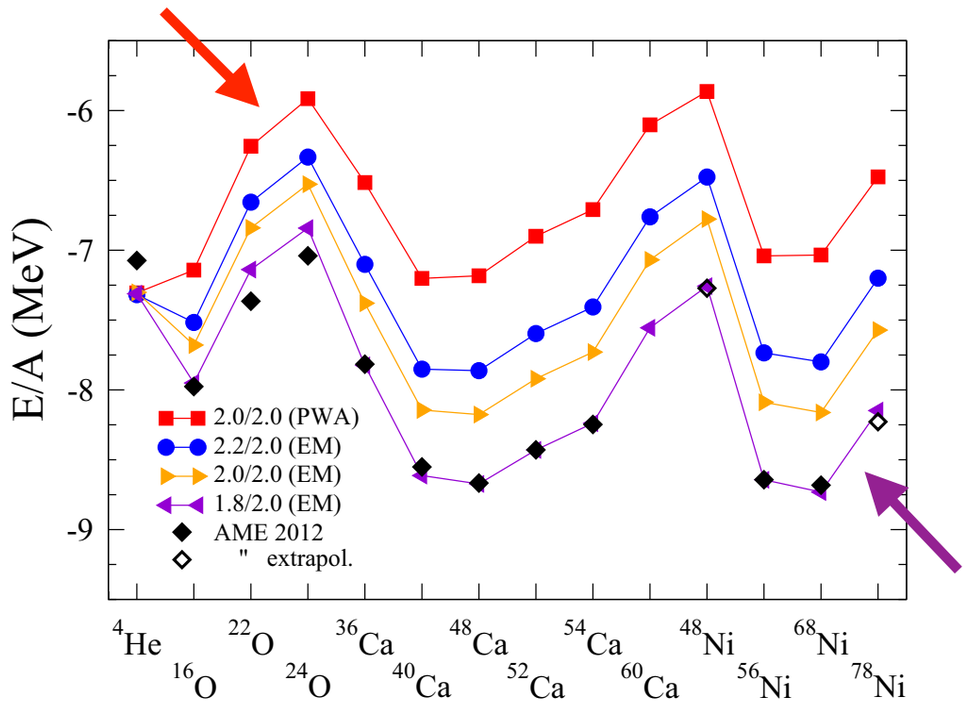
[Drischler *et al.* 2017]

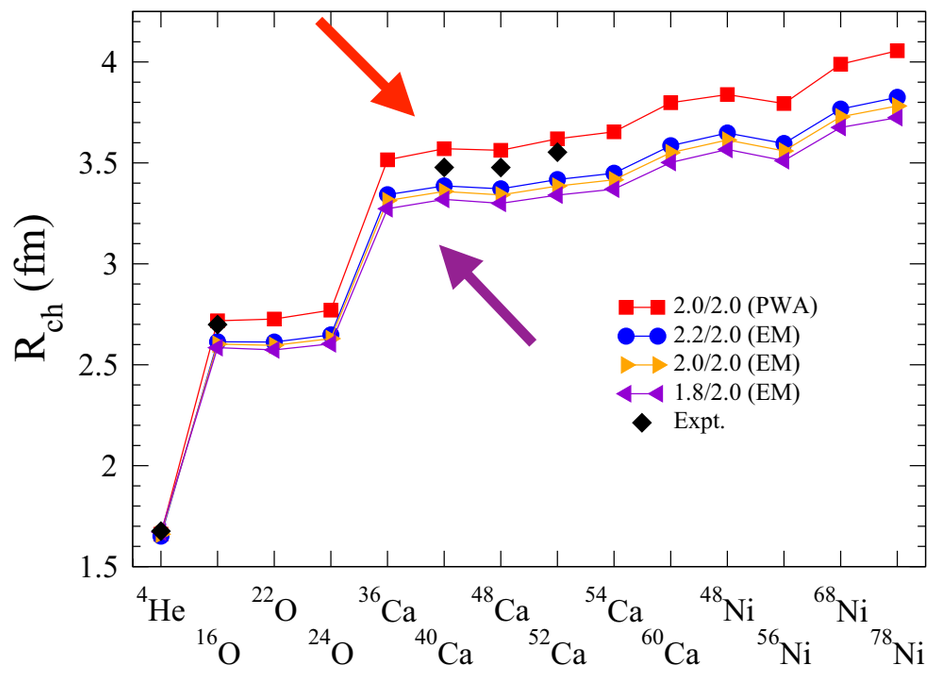


- “Family” of SRG-evolved interactions
- Radii ~OK only with strong underbinding
- Correlation with saturation properties
- More systematic studies needed

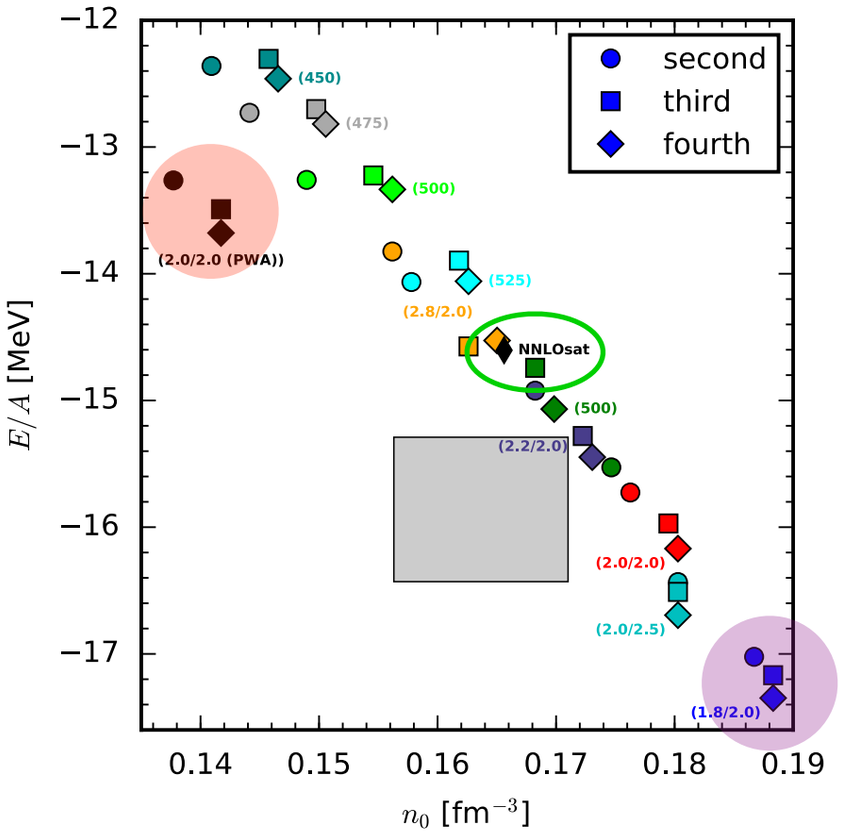
“Magic” interaction & proliferation of Hamiltonians

[Simonis *et al.* 2017]





[Drischler *et al.* 2017]



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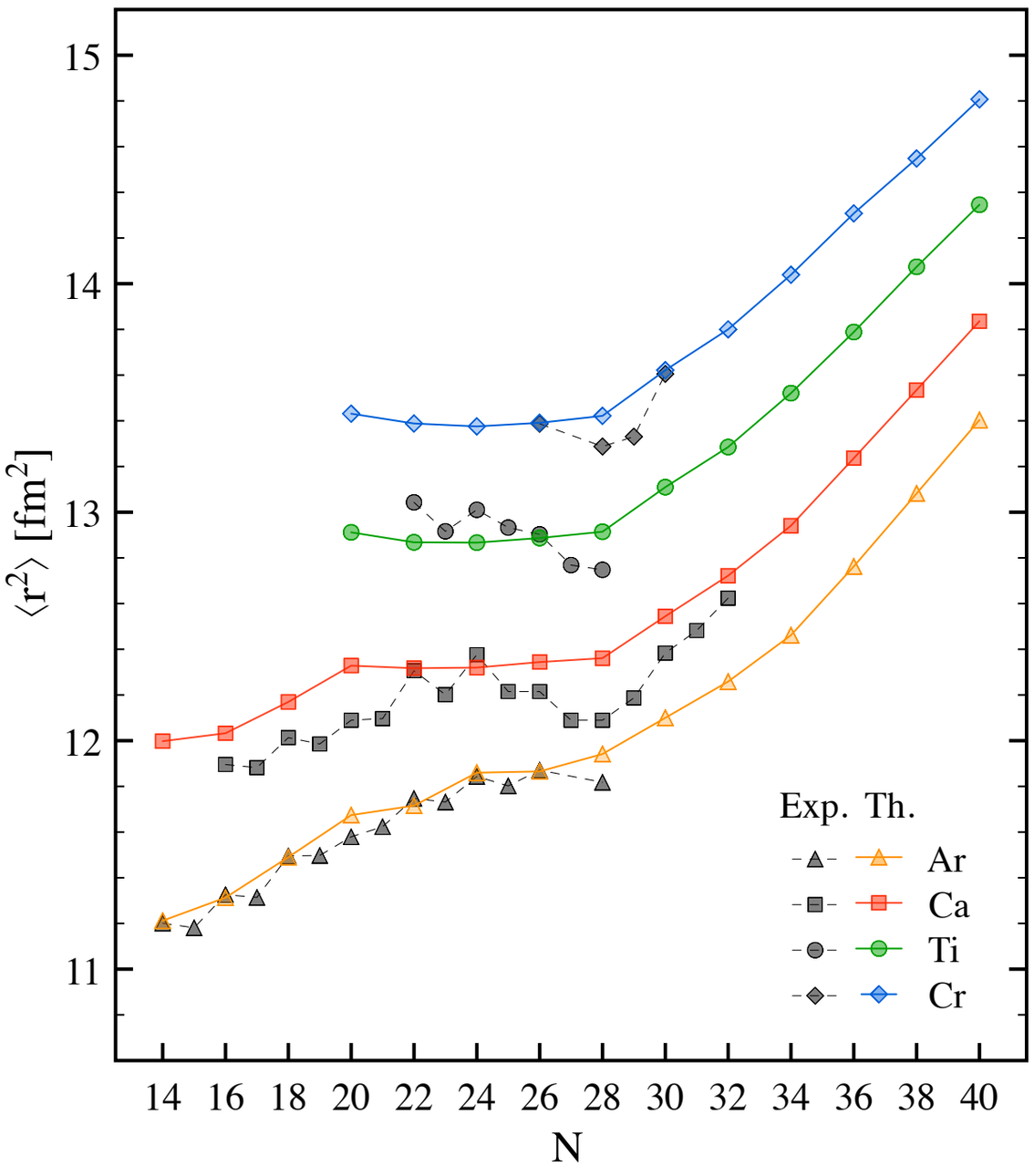
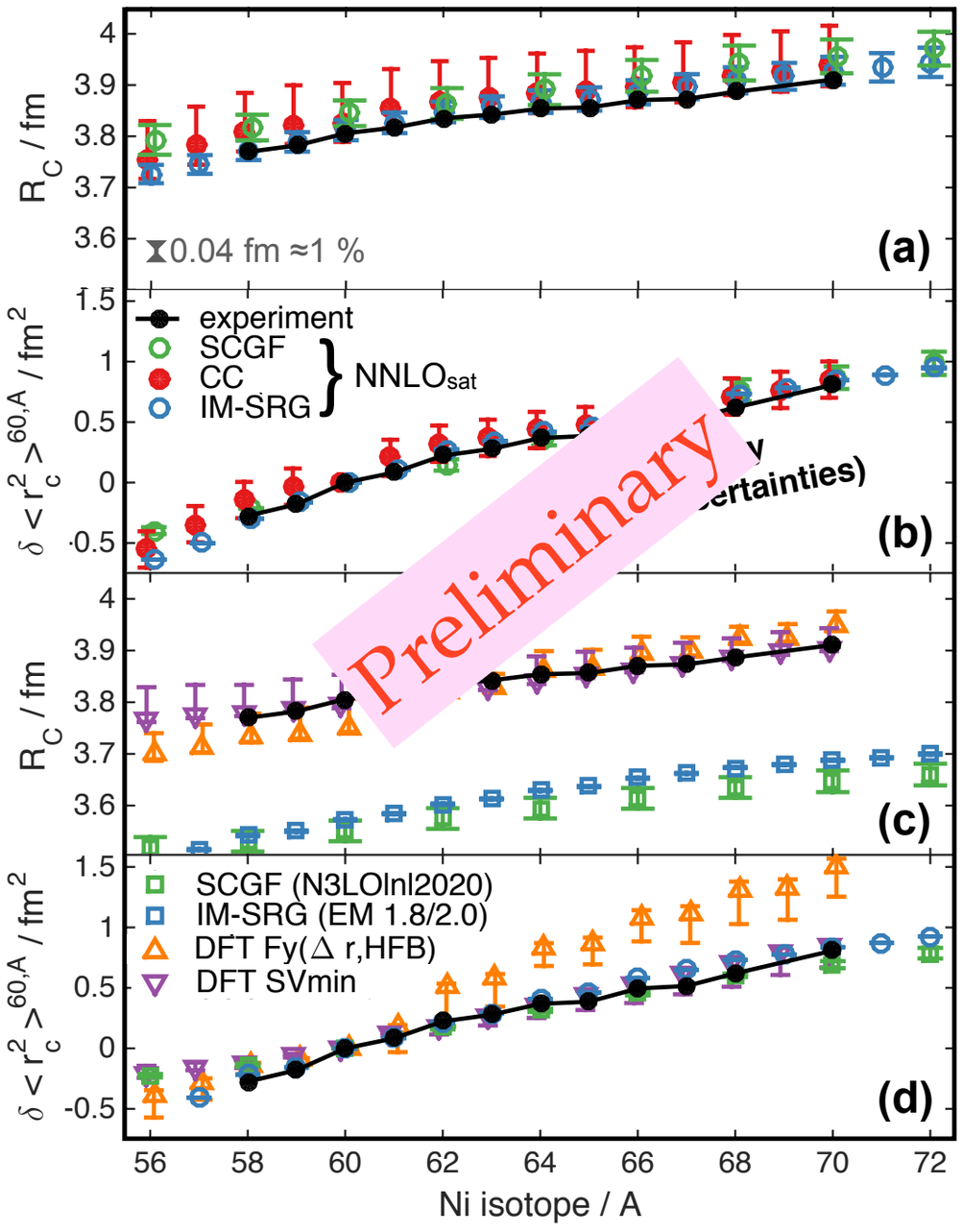
Nuclear sizes: charge radii

⊙ **Trends of charge radii reproduced along mid-mass chains**

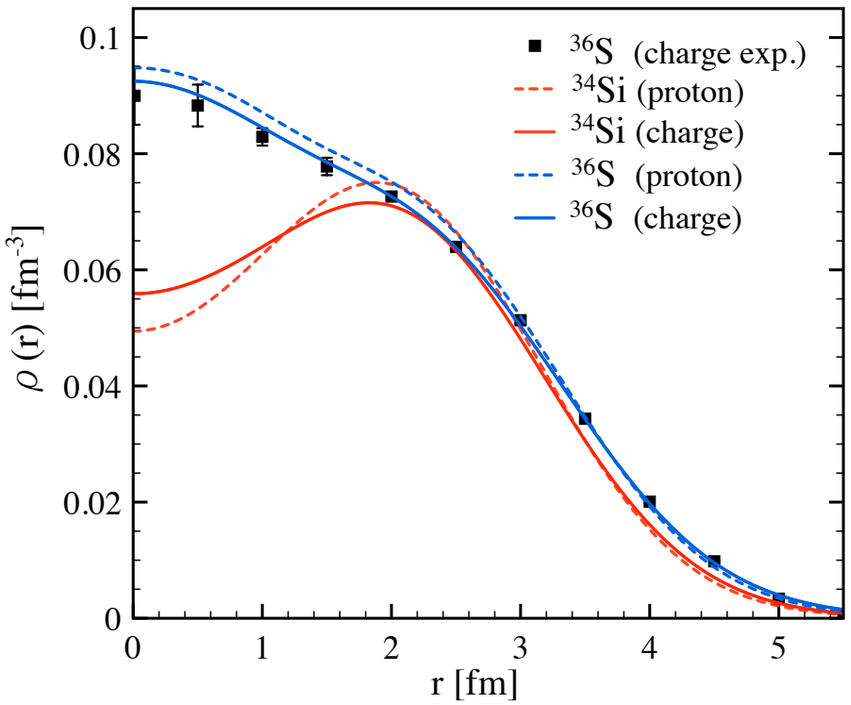


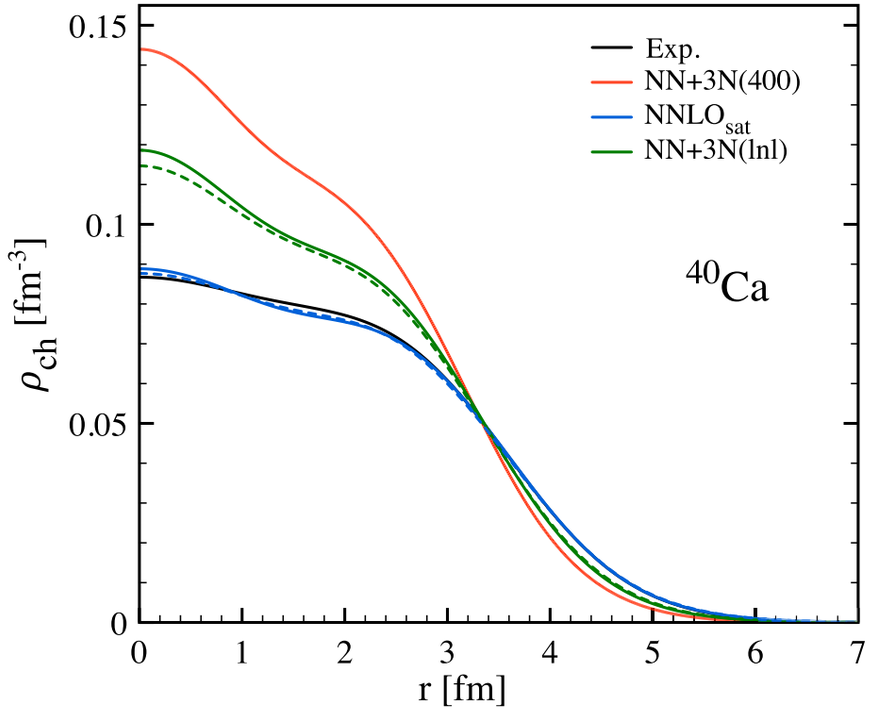
[Somà *et al.* 2021]



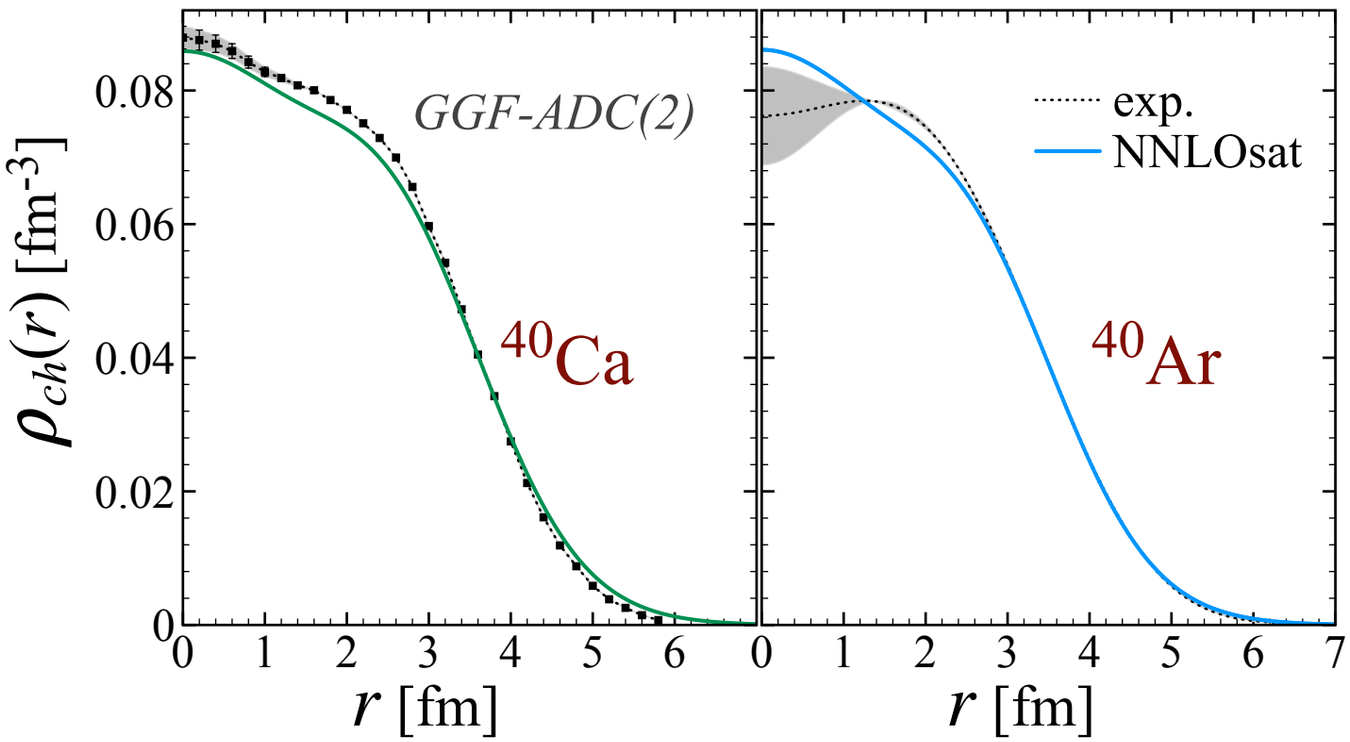
[Malbrunot *et al.* in preparation]

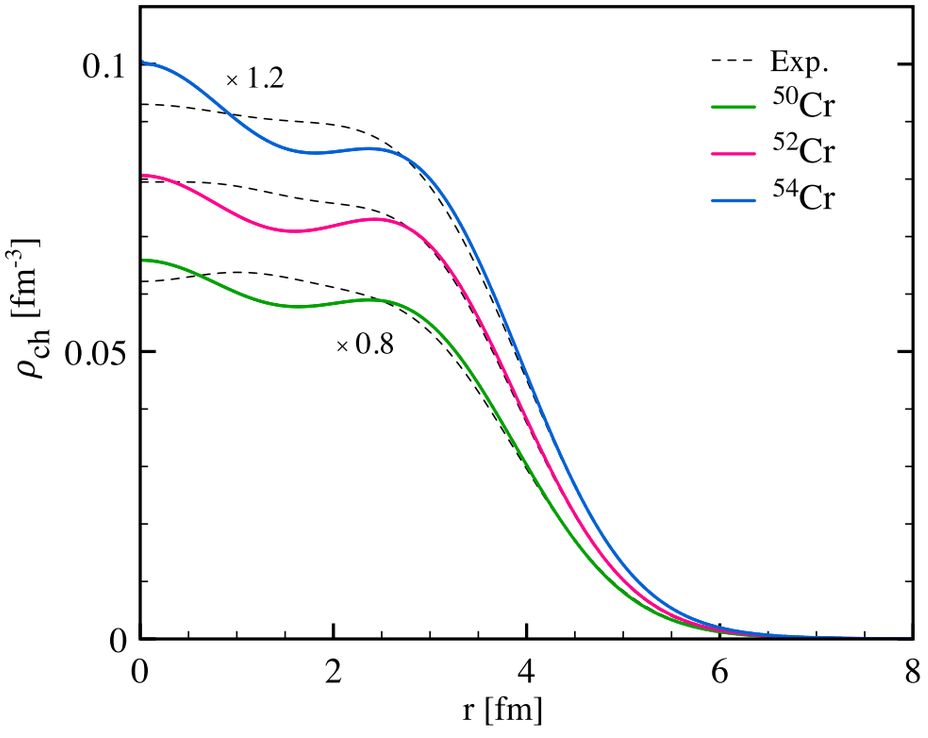
Density distributions



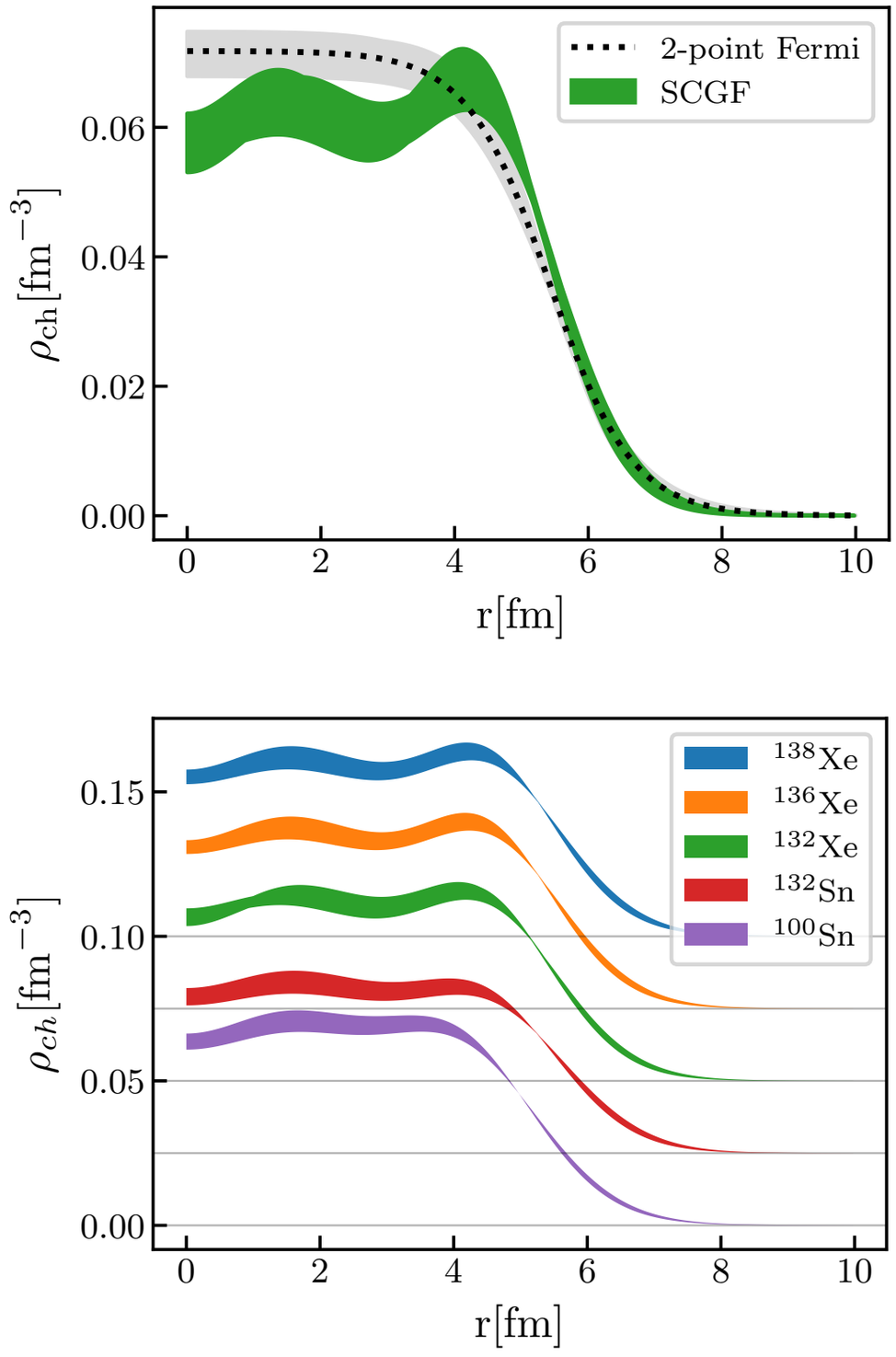


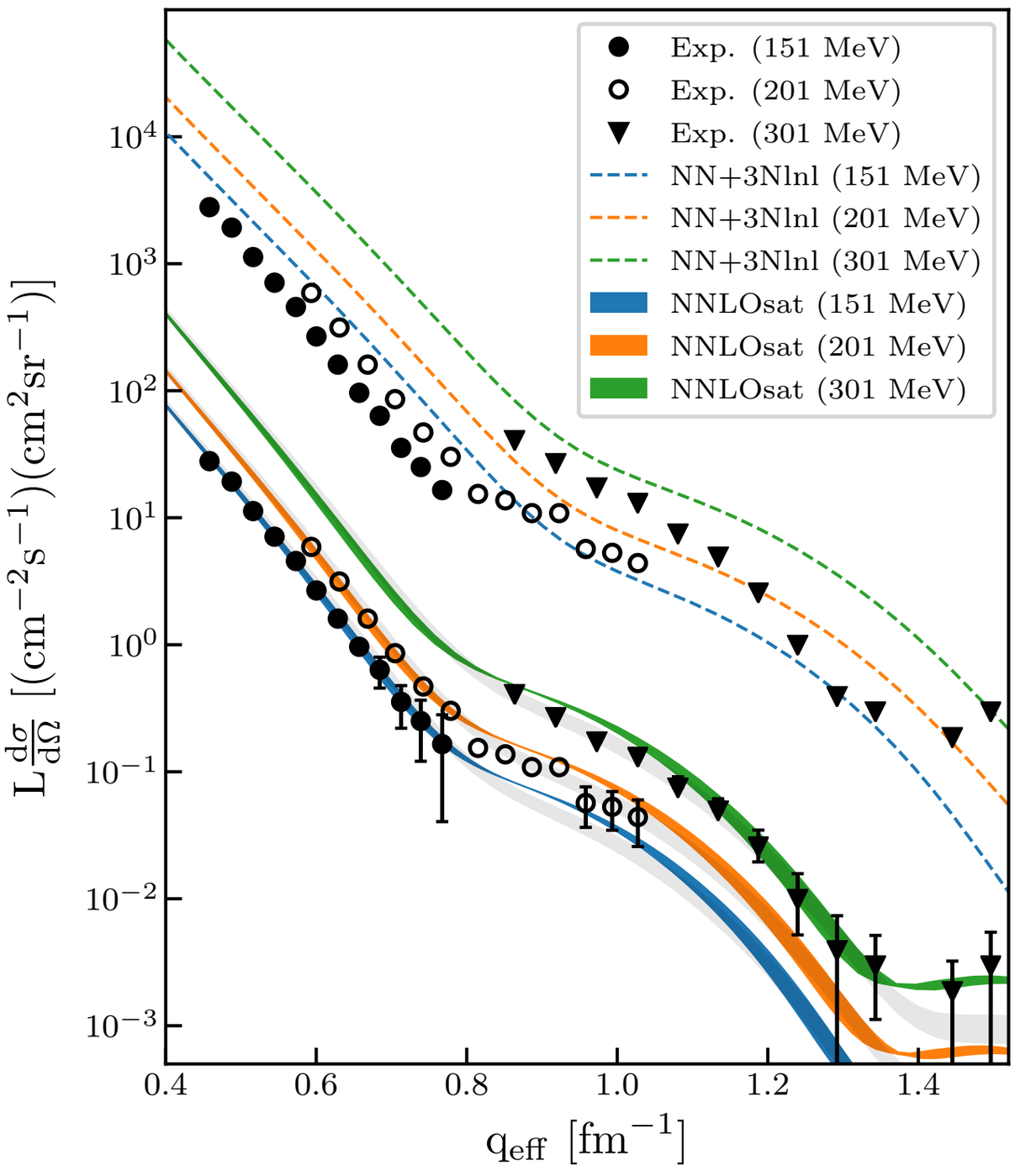
[Somà *et al.* 2020, 2021]





Towards heavier nuclei





[Arthuis *et al.* 2020]

Towards systematic calculations (with uncertainties)

⊙ **Evaluation of uncertainties from the Hamiltonian + the many-body method**

[Hüther *et al.* 2020]