Model Uncertainty

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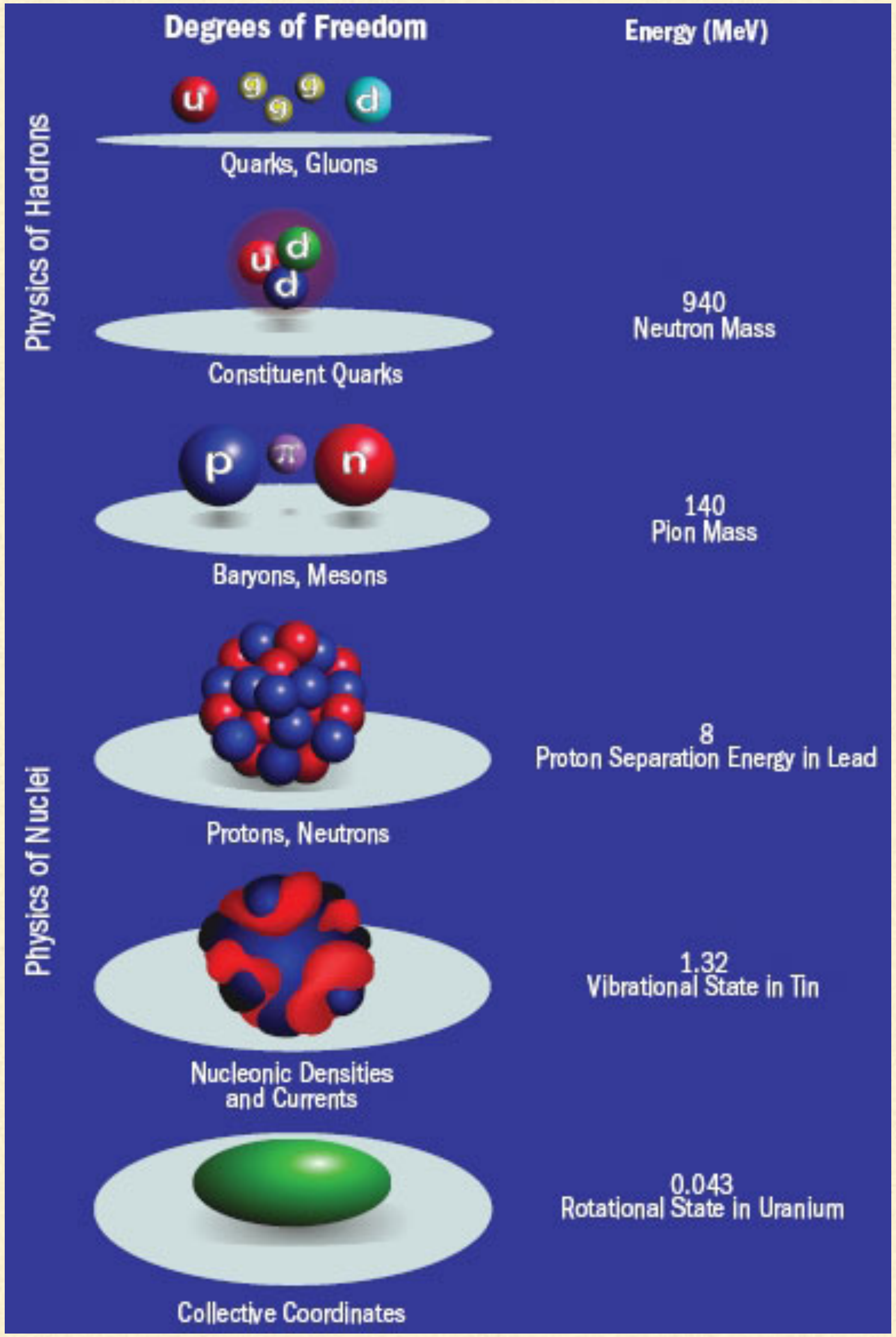
Model Uncertainty in EFTs

- "Every useful nuclear-physics model is the leading order of some EFT", T. Papenbrock



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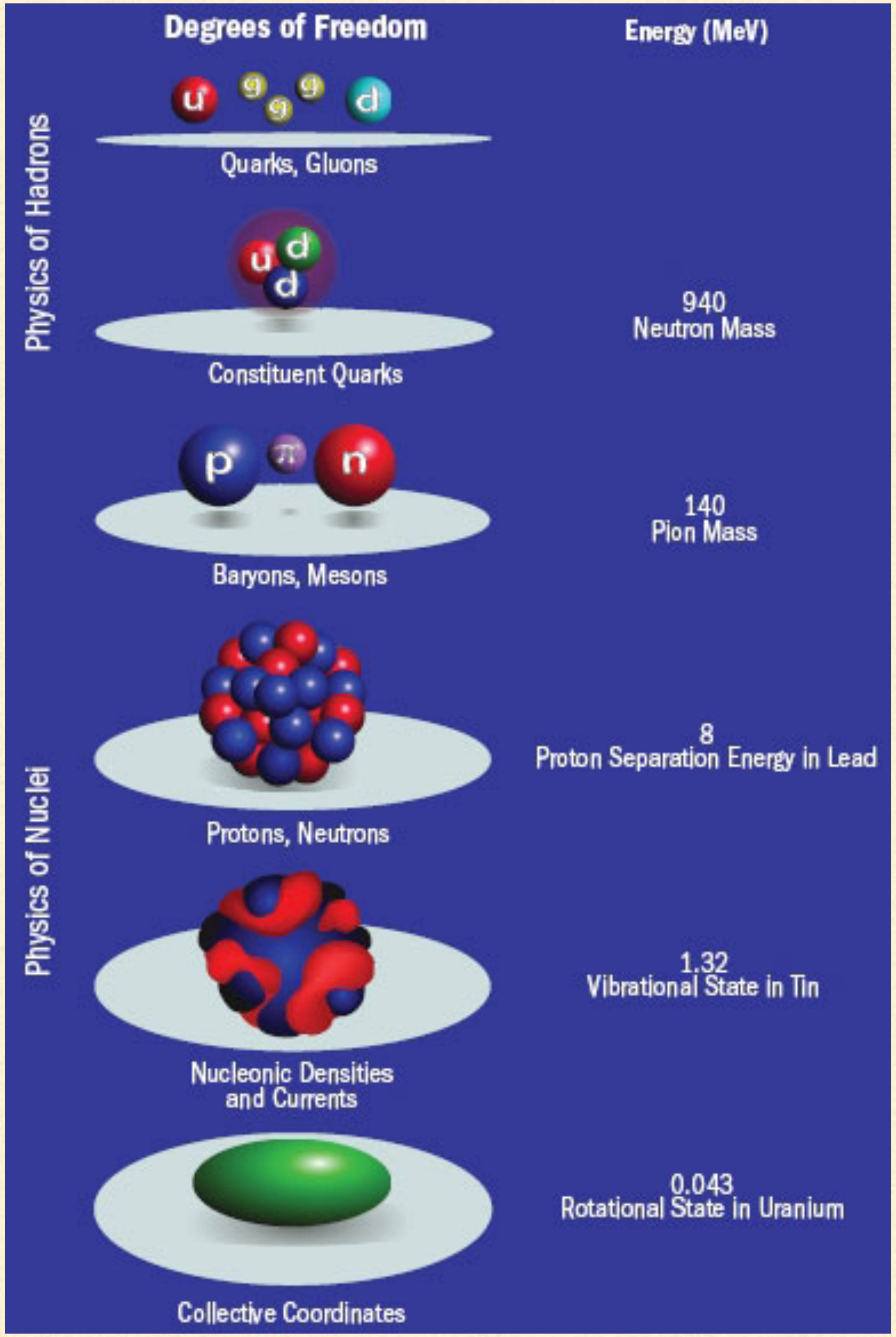

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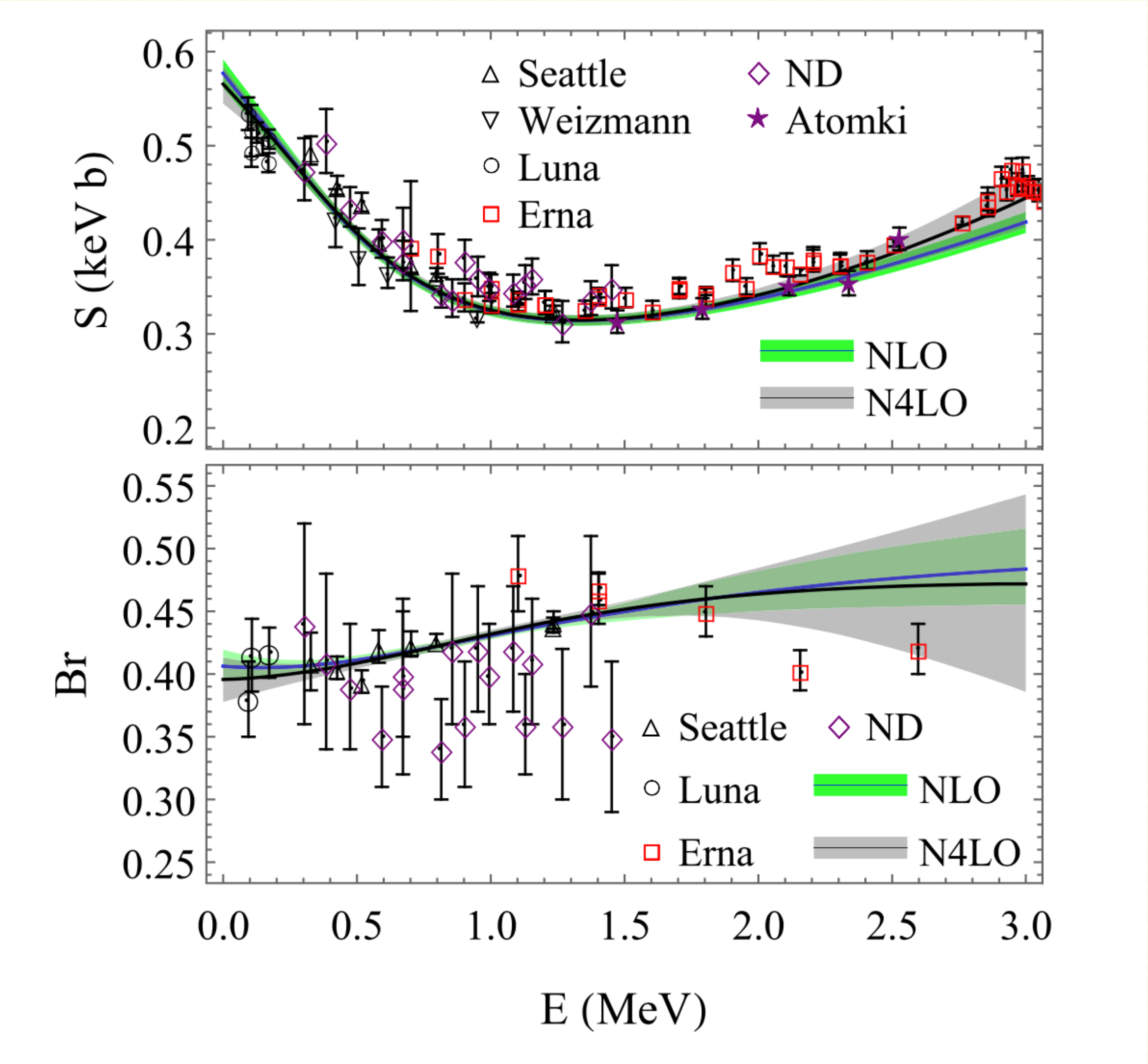

Zhang et al,., JPG 47 (2020) 054002

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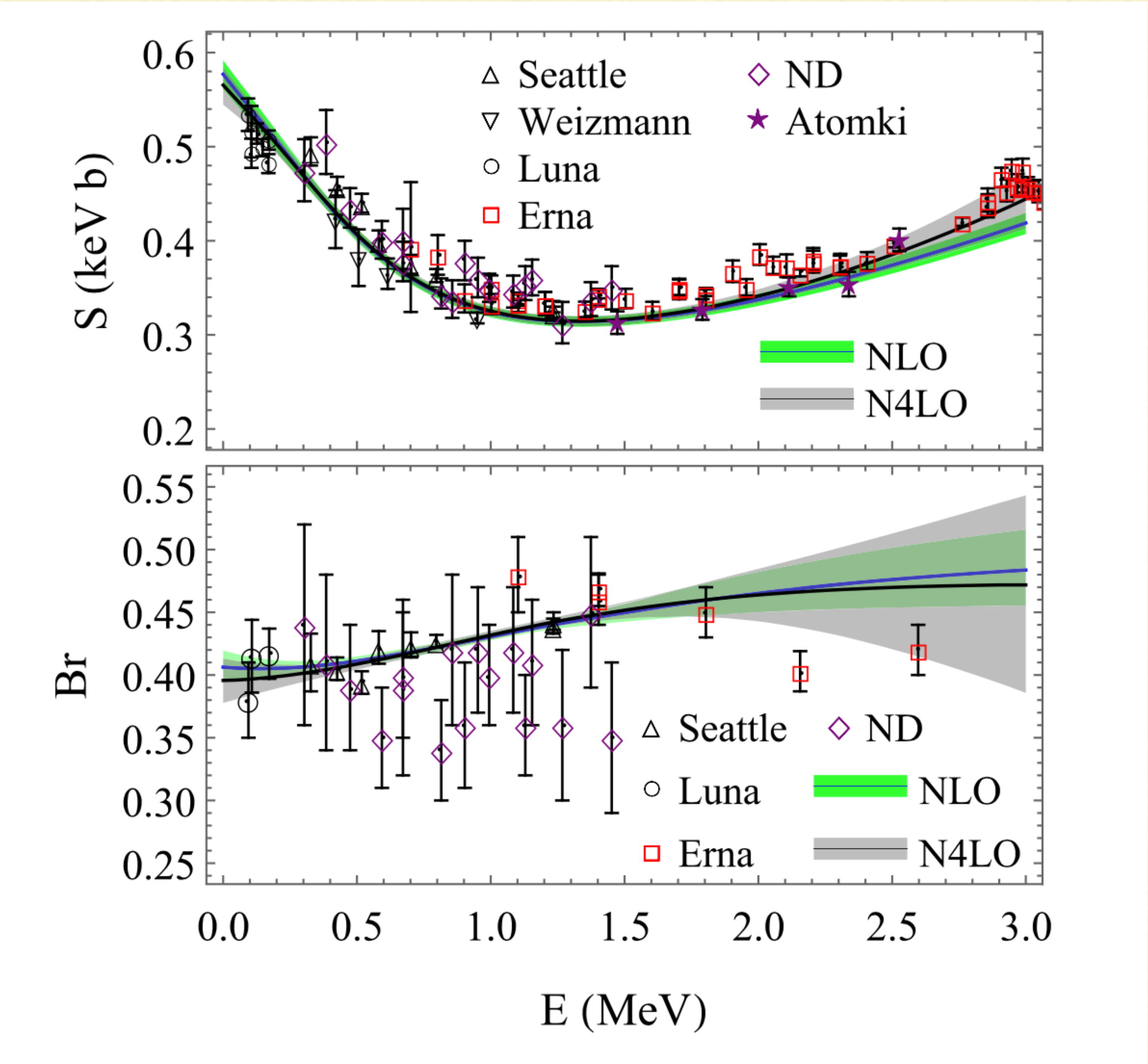
- EFTs are a systematic expansion in small expansion parameter(s). So another path to model uncertainty is to assess the truncation uncertainty: that due to stopping $y = y_{\rm ref} \sum_{n=0}^{k} c_n Q^n$ at order k



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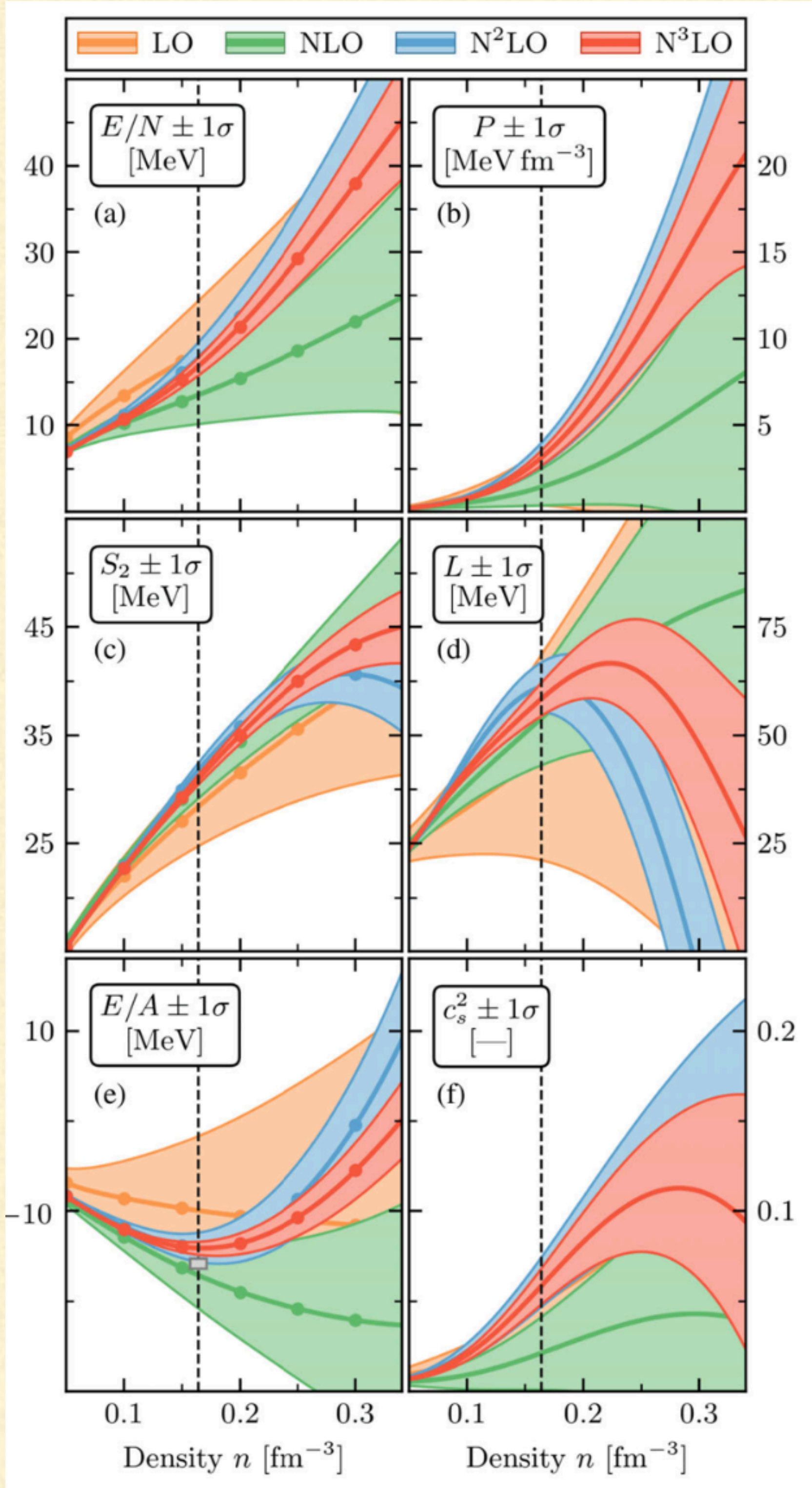

Drischler et al., PRL 125 (2020) 202702

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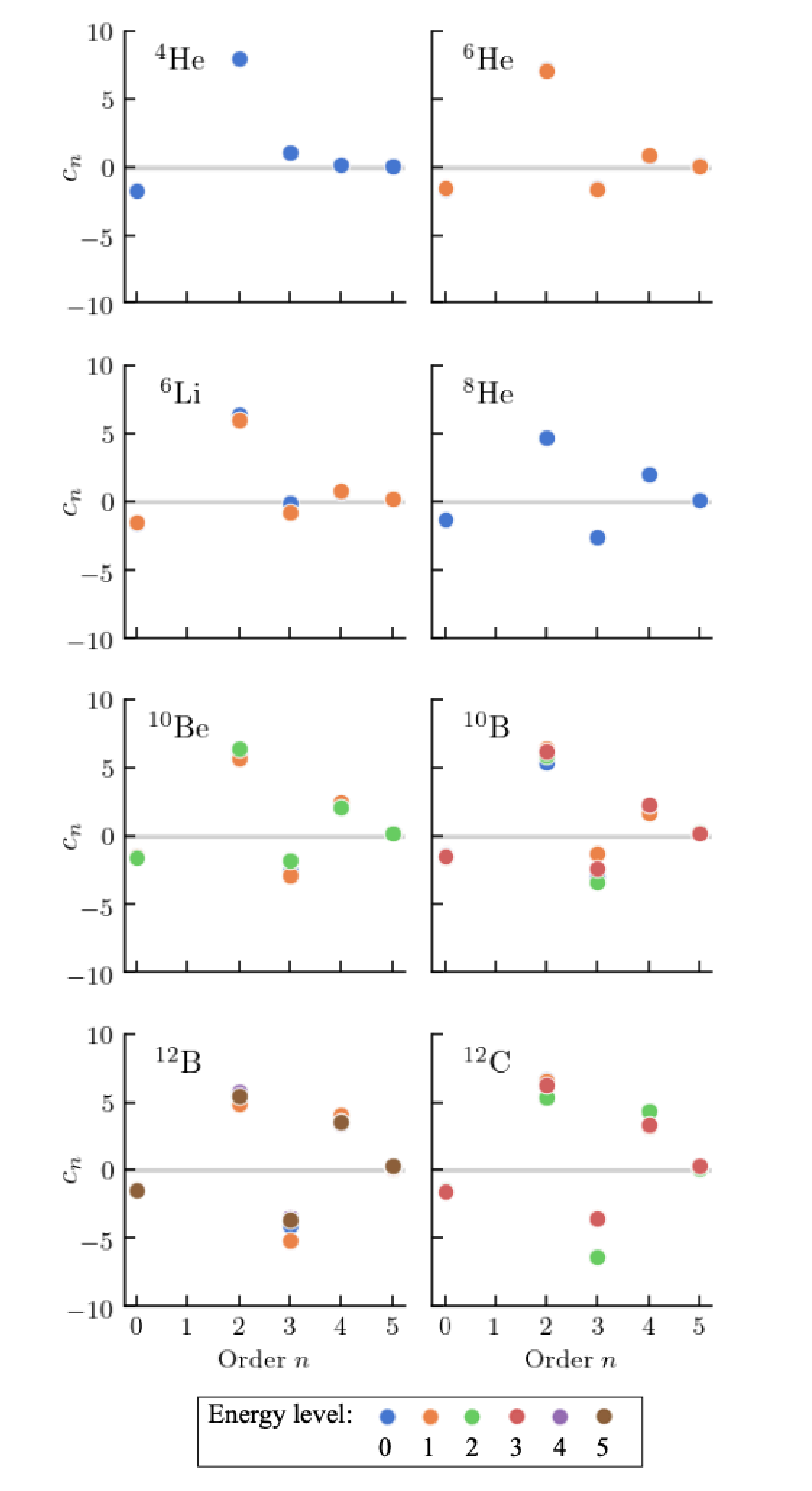

Maris et al., arXiv:2206.13303

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	$\mu_{^3\text{H}}$	σ_{np} [mb]	σ_{nd} [mb]	L_1 fit
LO	2.75(95)	325.2±225.6	0.315(217)	N/A
NLO	2.62(31)	*334.2± 79.7	0.180(43)	σ_{np}
NLO	*2.98(36)	370.0±88.0	0.345(82)	$\mu_{^3\text{H}}$
NLO	2.83(34)	354.1±84.5	0.274(65)	σ_{np} and $\mu_{^3\text{H}}$
NNLO	*2.98(12)	*334.2±27.5	0.475(39)	σ_{np}
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NNLO	*2.98(12)	*334.2±27.5	0.489(40)	σ_{np} and $\mu_{^3\text{H}}$
Exp	2.979	334.2(5)	0.508(15)	N/A

Lin et al., arXiv:2210.15650

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- What about problems for which there is, as yet, no convergent EFT? Does Bayesian Model Mixing provide an accurate way forward?

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$$\mathrm{pr}(y(x)\,|\,D) = \sum_{k=1}^{K} w_k(x)\mathrm{pr}(y(x)\,|\,D, M_k)$$