SCHEME:

\[ \text{DFT} \quad \leftrightarrow \quad \text{200 DFT PARAMETER SETS} \quad \text{STRUCTURE CALCULATION} \]

\[ \begin{align*}
& L \quad a_{\text{sym}} \\
& V \quad U_{n+k}
\end{align*} \]

\[ \begin{align*}
& g_n + g_p \\
& g_n - g_p
\end{align*} \]

SOFTNESS \( a \)

STeeper SURFACE \( a + \Delta a \quad \Delta a < 0 \)

\[ \begin{align*}
& \frac{dV}{dJ} \\
& a_{\text{sym}} \quad L \end{align*} \]

\[ \begin{align*}
& U_0 \\
& U_{n+1} \quad R_n
\end{align*} \]

\[ \begin{align*}
& a_n \\
& a_n + \Delta a
\end{align*} \]

\[ \begin{align*}
& R_n \\
& \Delta R
\end{align*} \]
Modified Koning-Delaroche Fits: $^{48}$Ca

In Koning-Delaroche: $R_{0,1} = R + \Delta R_{0,1}$, $a_{0,1} = a + \Delta a_{0,1}$
Modified Koning-Delaroche Fits: $^{90}\text{Zr}$

In Koning-Delaroche: $R_{0,1} = R + \Delta R_{0,1}$ \quad $a_{0,1} = a + \Delta a_{0,1}$
Modified Koning-Delaroche Fits: $^{120}$Sn

In Koning-Delaroche:  
\[ R_{0,1} = R + \Delta R_{0,1} \quad a_{0,1} = a + \Delta a_{0,1} \]
Modified Koning-Delaroche Fits: $^{208}\text{Pb}$

In Koning-Delaroche: $R_{0,1} = R + \Delta R_{0,1}$ $a_{0,1} = a + \Delta a_{0,1}$
Size of Isovector Skin

Colored: Skyrme predictions. Arrows: half-infinite matter

Large $\sim 0.9$ fm skins! $\sim$ Independent of $A$
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Large $\sim 0.9$ fm skins! $\sim$Independent of $A$...
Difference in Surface Diffusenessness

Colored: Skyrme predictions. Arrows: half-infinite matter
Sharper isovector surface than isoscalar!
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Colored: Skyrme predictions. Arrows: half-infinite matter

Sharper isovector surface than isoscalar!
Bayesian Inference

Probability density in parameter space $p(x)$ updated as experimental data on observables $E$, value $\bar{E}$ with error $\sigma_E$, get incorporated

Probability $p$ is updated iteratively, starting with prior $p_{\text{prior}}$

$p(a|b)$ - conditional probability

$$p(x|\bar{E}) \propto p_{\text{prior}}(x) \int dE \exp \left(-\frac{(E-\bar{E})^2}{2\sigma_E^2}\right) p(E|x)$$

For large number of incorporated data, $p$ becomes independent of $p_{\text{prior}}$

In here, $p_{\text{prior}}$ and $p(E|x)$ are constructed from all Skyrme ints in literature, and their linear interpolations. $p_{\text{prior}}$ is made uniform in plane of symmetry-energy parameters $(L, a_V^a)$
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Constraints on Symmetry-Energy Parameters

68% contours for probability density

$E_{\text{IAS}}^*$ - from excitations to isobaric analog states

in PD&Lee NPA922(14)1
Likelihood f/Symmetry-Energy Slope

$E_{\text{IAS}}^*$ - from excitations to isobaric analog states in PD&Lee NPA922(14)1

Oscillations in prior of no significance - represent availability of Skyrme parametrizations
Likelihood f/Symmetry-Energy Value

\[ E_{\text{IAS}^*} \] - from excitations to isobaric analog states in PD&Lee NPA922(14)1

Oscillations in prior of no significance - represent availability of Skyrme parametrizations