LLNL Research

Deuterium Normalization

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$$\log\left(P_E(\rho)/P_H(\rho)\right) = c(E)(\log\left(P_D(\rho)/P_H(\rho)\right)) + f(\rho, E)$$

"Excess constant" in $\log P_D/P_H$ affected residual f too much, so shift by d such that $\log\left(P_D/P_H\right) - d \to 0$

$$\log\left(P_E/P_H\right) = c(E)(\log\left(P_D/P_H\right) - d) + f(\rho, E)$$

Analysis on the residual function suggests that $\frac{f(\rho,E)}{c(E)}$ is inversely related to $m(E)$, i.e. $\frac{f(\rho,E)}{c(E)} = r + \frac{s(\rho)}{m(E)}$ for some constant r and some function $s(\rho)$ independent of element

$$\log\left(P_E/P_H\right) = c(E)\left((\log\left(P_D/P_H\right) - d + r) + \frac{s(\rho)}{m(E)}\right)$$

Strategy: SVD and project onto principal component for crude approximation of $c(E)$. Divide by $c(E)$ and extract $\log\left(P_D/P_H\right) + \mathcal{C}$ term, scale by $m(E)$ to see approximate shape of $s(\rho)$. Use $s(\rho)$ and least squares to get more accurate $c(E)$, and repeat process