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Direct capture potential models in light of halo EFT, and vice versa KENNETH NOLLETT, San Diego State University, XILIN ZHANG, University of Washington, DANIEL PHILLIPS, Ohio University — Use of measured nuclear cross sections in astrophysics requires extrapolating and interpolating models. For the direct captures ^{7}Be(p, γ)^{8}B and ^{3}He(α, γ)^{7}Be, two-body potential models have served this role usefully for decades, using wave functions generated at all radii from a single potential well. Halo effective field theory (halo EFT) provides a newer way to encode many-body physics in a two-body formalism; like potential models, halo EFT is dominated by large-distance contributions to the matrix elements. Our halo EFT implementations of these reactions describe long-range contributions in terms of the effective range expansion and asymptotic normalizations, while encoding short-range contributions in contact interactions similar to R-matrix radiative widths. We have established the correspondence between the two formalisms by constructing representations of specific potential models within halo EFT, and we have used potential models to examine EFT power counting and truncation error. We will present insights into both types of model that resulted, in particular regarding the nature of short-distance effects and the role of model selection in astrophysical uncertainty quantification.

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