Simplified approach to the application of the geometric collective model

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abstract The predictions of the geometric collective model (GCM) for different sets of Hamiltonian parameter values are related by analytic scaling relations. For the quartic truncated form of the GCM — which describes harmonic oscillator, rotor, deformed $\gamma$-soft, and intermediate transitional structures — these relations are applied to reduce the effective number of model parameters from four to two. Analytic estimates of the dependence of the model predictions upon these parameters are derived. Numerical predictions over the entire parameter space are compactly summarized in two-dimensional contour plots. The results considerably simplify the application of the GCM, allowing the parameters relevant to a given nucleus to be deduced essentially by inspection. A precomputed mesh of calculations covering this parameter space and an associated computer code for extracting observable values are made available through the Electronic Physics Auxiliary Publication Service. For illustration, the nucleus $^{102}$Pd is considered.