Order-to chaos transition in the Geometric Collective Model using geometric criteria

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A method of differential geometry, proposed by Horwitz *et al.* [1], is applied to study the transition between regular and chaotic dynamics in the classical version of the Geometric Collective Model (GCM) of atomic nuclei [2]. The Hamiltonian of the system is expressed in terms of the curvature associated with a Riemannian metric tensor and, using a simple algebra without the need of solving differential equations, it is possible to find the energy where unstable motion appears. We show that the geometrical method is in agreement with a careful numerical analysis of regularity based on the measure calculated from Poincaré sections. It is also observed that the condition of stability corresponds with the changes in the shape of the boundary of the potential at a given energy (kinematically accessible region) [3]. This correspondence has been recently proven [4].

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