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First comparison between microscopic and macroscopic-microscopic potential energy surfaces for the description of fission

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Until now, the theoretical description of fission through the effective calculation of potential energy surfaces (PES) has been made in two different approaches: the microscopic approach on the one hand and the macroscopic-microscopic approach on the other hand.

1. In the microscopic ones, we assume an effective two-body interaction between the nucleons (e.g. Skyrme or Gogny interaction). The microscopic state of the nucleus is then obtained with a self-consistent mean-field method (e.g. HF, HFB). These approaches allow us to connect fission properties to the basic constituents of the nucleus and their interaction using a few parameters (< 15) but are time-consuming.
2. In the macroscopic-microscopic ones, we calculate in a first step the macroscopic part of the energy by describing the nucleus as a classical system (e.g. Liquid Drop Model). In a second step, we add microscopic correlations using, for example, the Strutinsky method and the Lipkin-Nogami pairing model. These approaches are very fast and in good agreement with experimental data, but cannot take into account all microscopic correlations.

The aim of this work is to couple both kind of approaches. As a first step in this work, potential energy surfaces for the same nucleus have been generated with both approaches. In this presentation, the first part will detail each approaches, and the second part will show a first comparison between potential energy surfaces obtained with each of them.

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