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Collective and dissipative effects in a common microscopic dynamical description

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Depending on the energy regime, the dynamics of heavy-ion collisions reveals a variety of different mechanisms which are attributed to the combination of collective and dissipative effects.
Whereas at low and high energies only one of the two contributions tends to prevail, the description of Fermi-to-intermediate energy regimes imposes to address the interplay between collective and chaotic processes.
Semiclassical approaches have been successful in describing chaotic regimes at Fermi-energies but they gradually lose precision when extending to collective behaviours and in general when low-energy features becomes more determinant in the dynamics.
To improve on this description, we propose a theoretical approach starting from the TDHF scheme.
A multiple-ensemble representation has been worked out in order to give a simplified solution to handle the evolution in time and to introduce beyond-mean-field extensions and stochastic contributions.
In particular, we can treat collisional correlations and large-amplitude fluctuations in order to address clusterisation processes, which characterise the out-of-equilibrium dynamics of dissipative heavy-ion collisions.
Selected applications to Ar+Ni and Ca+Ca reactions at Fermi-energies will be addressed.

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