SHELLS, ORBITS AND TRANSPORT COEFFICIENTS OF THE NUCLEAR COLLECTIVE DYNAMICS

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To the 75-th anniversary of birth of Vilen Mitrofanovich Strutinsky

The Strutinsky shell correction method is applied to the nuclear collective dynamics within the periodic orbit theory extended to dissipative phenomena through some effective residue interactions. The macroscopic limit of the semiclassical transport coefficients with the known wall formula for the friction is obtained. The shell corrections to the stiffness, the inertia and the friction parameters are calculated analytically as function of the particle number and temperature for the low-energy excitations of heavy nuclei. It is shown that they are approximately proportional to the free-energy shell corrections, with the same sign for the inertia and the opposite one for the stiffness and the friction. The shell oscillating components of the transport coefficients disappear exponentially at temperatures larger than the ones of the free energy. The reduced friction and the energy excitation estimations are in agreement with some experimental data and theoretical calculations.