Evolution of multi-component spiral disc galaxies: dynamics of gas, stars and dark matter.

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We present a numerical N-body/hydrodynamics code for investigating the evolution of disc galaxies in the context of secular processes and ISM transformation. Hydrodynamical equations were solved using TVD-MUSCL scheme with the extended thermodynamics, magnetic field and the possibility of the multi-species simulations. N-body approach was used for describing of the dynamics of stellar particles, DM halo particles and/or dust grains. The gravitational potential was calculated by FFT. The whole code was adopted for the parallel application using MPI standard. A two different kinds of decomposition were applied for calculation the hydrodynamical and Poisson equations. We briefly discuss recent results in simulations of the hydrodynamic processes involved in the formation of a galactic spiral pattern, the evolution of gas-dust clouds and other possible applications of the code. Our numerical experiments were performed using supercomputers of the Moscow State University — Lonomosov and Chebyshov (NIVC MSU).