

**Numerical modeling of 3D dynamic processes in the heterogeneous continuous medium**  
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In the paper, a software package designed for simulating problems of geomechanics and seismic methods for high-performance computing systems. The software complex is developed using high-precision computational algorithms for the solution of spatial problems of seismic prospecting of hydrocarbon deposits, including offshore and Arctic zones, in high-performance computing systems. The developed methods allow to describe correctly the wave processes occurring in the earth's crust with multiple inhomogeneous inclusions (cracks, laminations, karst formations, etc.). The models of the fractured, layered, porous geologic media and suggests methods of solving the corresponding multidimensional dynamic problems of seismic prospecting in full wave approximation. The use of hierarchical meshes with a multiple time step and high-performance systems will allow us to describe the geometry as close to real life. Also developed threaded algorithms for the numerical solution of dynamic spatial tasks on high-performance multiprocessor computer systems.

The use of grid-characteristic methods in interpolation of high order allows you to apply the most correct computational algorithms on the borders, and contact borders of the region of integration, to take into account the physics of the problem (propagation of discontinuities along characteristics). The use of full closed system of equations of continuum mechanics and characteristic of methods will allow all features of seismic processes, velocity field, stress field, deformation) and to compare the calculated and field seismograms for the subsequent solution of the inverse problem, to identify patterns of behavior of heterogeneous media on the basis of numerical experiments.

Note that all numerical methods and software complexes aimed at solving applied problems of gas and oil industry in Russia.