

Computational problems in Arctic Research

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We can highlight some of the major classes of problems at the Arctic area, which can be solved by numerical simulations on high-performance computing systems:

- Simulation of the interaction of different ice formations (icebergs, hummocks, and drifting ice floes) with fixed ice-resistant platforms;
- Simulation of the interaction of icebreakers and ice-class vessels with ice formations;
- Modeling of the impact of the ice formations on the ground pipelines;
- Neutralization of dangerous for fixed and mobile offshore industrial structures from ice formations;
- Calculation of the strength of the ground pipelines;
- Transportation of hydrocarbons by pipeline;
- The problem of migration of large ice formations;
- Modeling of the formation of ice hummocks on ice-resistant stationary platform;
- Calculation the stability of fixed platforms;
- Calculation dynamic processes in the water and air of the Arctic with the processing of data and its use to predict the dynamics of ice conditions;
- Simulation of the formation of large icebergs, hummocks, large ice platforms;
- Calculation of ridging in the dynamics of sea ice;
- Direct and inverse problems of seismic prospecting in the Arctic;
- Direct and inverse problems of electromagnetic prospecting of the Arctic.

The system of equations for modeling of these processes is the system of equations which describes continuum mechanics, in particular, solid state physics, acoustics, and fluid dynamics.

For the numerical solution of the relevant problems it is necessary to develop or adopt adequate modern computational methods and algorithms for high-performance computers.

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