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Elastic Imaging using Multiprocessor Computing Systems

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One of the main methods for search and exploration of oil and gas deposits and understanding the structure of the Earth's crust is the seismic survey. The migration process allows us to estimate the position of geological boundaries under the day surface. A lot of different migration techniques were developed using the acoustic approximation. One of the obvious improvements is the transfer to the elastic medium model that successfully describes P-waves and S-waves. Consequences of it – the growth of numerical complexity of the mathematical problem and the increase of computer resource requirements. Real field data contain the information about kilometers of area and for the reasonable imaging the step of computational mesh must be from one to ten meters. Thus, for the realization of elastic migration procedures it is necessary to use modern HPC systems. The goal of this work was the development and investigation of the elastic imaging method using Born approximation for quasi-homogeneous elastic media. The research software in Mathematica system was developed, and a set of calculations for simple geological models were carried out using 12-cores shared memory system. The assessment of the scalability shows approximately 90 % of effectiveness.

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Summary

The research software based on the new elastic imaging method using Born approximation for quasi-homogeneous media was developed. The assessment of the scalability on 12-cores shared memory system shows approximately 90 % of effectiveness.

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