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A Numerical Simulation of Poroelastic Cylinder Decompression Problem on CUDA in an Axisymmetric Domain

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The reliability of geomechanical and petrophysical laboratory experiments depends on coring operation. One of the steps where the core material undergoes critical loads is decompression during the core retrieval operation. Currently, a few numerical and analytical models simulate that process only with critical simplifications. The analytical solution considers only homogeneous media that neglects micro defects. FEM methods calculate slower than FDM up to several orders, simulating lifting processes with dynamic boundary conditions.

We present an axisymmetric cylindrical model of fully coupled fluid flow and elastic deformation solution by pseudo-transient numerical method. Calculation in the physical domain allows for high efficiency of parallelization on GPU, making it possible to simulate with high resolution of loading a core sample.