

Preconditioning in Reservoir Simulation

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Oil and gas reservoir simulation entails solving systems of coupled nonlinear PDEs describing the flow of fluids (typically oil, water and gas) through porous media. Most of the computational time is spent on solving the resulting linearized systems with a preconditioned Krylov subspace method. The main preconditioning techniques still use the approach introduced by Wallis in 1983, the Constrained Pressure Residual (CPR) preconditioner. In this method, an accurate preconditioner is used for the pressure subsystem, in combination with a cheaper preconditioner for the full system. In this poster, we discuss the details of these two-stage preconditioners and how to treat the coupling between the pressure and the other variables.

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