

POD-based Deflation Methods for Two-Phase Reservoir Simulation

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We propose the use of deflation techniques based on previously obtained information of the system to reduce the time spent in the solution of linear systems. Information about the system can be obtained by solving the problem with small variations, e.g., diverse time steps or sources. We propose the use of these solutions, also called snapshots, to accelerate the solution of similar systems. To decrease the number of iterations without a great increase in the required computing operations per iteration it is important to find good deflation vectors. The use of deflation vectors based on a POD-reduced set of snapshots that contain information about the system is proposed in this work. We investigate the convergence and the properties of the resulting methods with numerical experiments. We consider incompressible two-phase flow in a layered model with variations in the contrast between permeability layers up to 10^7 . We also study the SPE 10 benchmark model with a contrast in permeability coefficients of 10^7 .

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