

INVITATION TO THE LECTURE

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CONFERENCE ROOM

ALGEBRAIC AND FUNCTIONAL APPROACH TO BLOCK PRECONDITIONERS IN POROELASTICITY

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The aim of this talk is to present an application of the operator preconditioning framework to the three field formulation of Biot's poroelasticity. Biot's model of poroelasticity is a linear system of PDE's that models the saturated flow through porous media. We will consider the time step problem coming from semidiscretization in time by implicit Euler method. The resulting time step problem will be formulated in a weak formulation and discretized by conforming finite elements.

Two possible preconditioning strategies will be presented. Both are based on block Schur complements where the blocks correspond to physical fields and both aim to construct a block diagonal preconditioner and establish estimates of the related condition number. One strategy, called here algebraic, will construct the preconditioner to the linear algebraic system of equations that arise after the finite element discretization. The other, functional, will first construct the preconditioner on the operator/functional level and discretize the resulting operator. We will analyze and compare both approaches and their related preconditioners and point out their common points and differences and argue that they can be seen as a two instances of the same general idea that views preconditioners as certain scalar products.