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Contribution ID: **596** Type: **Oral Presentation**

Block-partitioned solvers for poromechanics via gradient flows and minimization

Wednesday, 2 June 2021 19:35 (15 minutes)

Dissipative processes can be often modeled as gradient flows, closely related to thermodynamical principles; flow in deformable porous media e.g. modeled by the Biot equations also falls into this category. A gradient flow structure can have various benefits including access to the well-posedness analysis or development of numerical solvers by employing abstract mathematical tools and concepts.

In this talk, we focus on the development of block-partitioned solvers for coupled poromechanics from a gradient flow perspective [1]. After time discretization, a gradient flow structure translates to an optimization structure. Ultimately, robust solvers can be developed by application of alternating minimization, which are widely applied in convex analysis. Convergence can be studied by employing abstract tools, resulting in sharp convergence rates. This approach covers previous results and methods (e.g. fixed-stress and undrained split) for the well-studied Biot equations, previously obtained by case-specific analyses. Yet, our approach extends to a more general class of poromechanics problems and enables a systematic approach for extensions involving e.g. viscoelastic effects, permeability multiple-network poroelastic effects, and nonlinear effects, among others.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

[1] Both, J.W., Kumar, K., Nordbotten, J.M. and Radu, F.A., 2019. The gradient flow structures of thermo-poro-visco-elastic processes in porous media. arXiv:1907.03134.

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