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ADVANCES IN NUMERICAL METHODS ON POLYTOPAL GRIDS FOR COUPLED PROBLEMS

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ABSTRACT

The numerical solution of coupled problems is of crucial importance; indeed, phenomena with different spatial or temporal scales, the interaction of several physical laws, and objects with different materials and properties are frequently found in nature. The precise approximation of these kinds of problems through numerical methods often requires different constraints on geometrical details, scale resolution, or local refinement of the computational mesh. To address these challenges effectively, polytopal meshes have emerged as an attractive approach due to their exceptional flexibility in representing intricate geometries, interfaces, and heterogeneous media. Numerical methods that can handle complex geometries with polygonal/polyhedral meshes (such as Discontinuous Galerkin, Virtual Element, Hybrid High-Order, ...) are usually called Polytopal Methods and - due to their ability to handle non-conforming interfaces, hanging nodes, and elements with different shapes - are well-suited for tackling coupled problems.

The use of Polytopal Methods offers numerous benefits: *(i)* accurate representation of complex geometries, *(ii)* flexibility in refinement and agglomeration strategies, *(iii)* ability to cope with non-conforming interfaces, *(iv)* robustness with respect to heterogeneities of physical properties, *(v)* arbitrary-order accuracy.

The primary objective of this minisymposium is to explore recent advancements in polytopal methods and their application in the context of coupled problems. Although not limited to these topics, the symposium will primarily focus on coupled poromechanics modeling geological materials and biological tissues, non-isothermal flows and deformation processes, bulk-surface couplings, fracture and contact mechanics, and fluid-structure interaction problems. Moreover, it will also encompass discussions on the utilization of polytopal methods in other biological or industrial applications.

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