Advances in solution strategies for physical processes in porous media with complex geometries

TRACK Number 4000

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**Key words:** Fractured porous media, mixed-dimensional partial differential equations, splitting strategies.

ABSTRACT

*A wide range of industrial applications, such as exploitation of subsurface resources (e.g., geothermal, hydrocarbon) and geological waste disposal (e.g., nuclear), requires accurate description of physical processes in underground basins. These are porous media where phenomena like single and multi-phase fluid flow, transport of pollutants or chemical species, as well as the mechanical response of the rock to various simulations can be considered. The difficulty of making laboratory experiments makes numerical simulations particularly suited as a predictive tool.*

*In this mini-symposia, we are particularly interested in the challenging aspects related to the geometrical complexity of these problems. In fact, the subsoil is typically crossed by intricate networks of fractures or faults, with an intrinsic multiscale nature. Moreover, physical data are strongly heterogeneous and can abruptly change between two neighboring cells. The challenges under scrutiny are even at the heart of some biological models like modeling flow in the vascular system. Unconventional mathematical models and numerical schemes, able to deal with such challenges are thus crucial for effective and reliable predictions. Examples are robust meshing strategies, non-conforming or polygonal discretization methods, reduced order models, and coupling strategies for mixed-dimensional problems. Among other things, these models must deal with several domains of different sizes separated by interfaces, and in many cases must be combined to provide tractable approaches that handle jumps in physical quantities as well as to handle the very different time scales that occur in different areas.*

*This mini-symposium is aimed at collecting the most recent methods and models based on non-standard approximation strategies in complex domains for simulating underground flows and related applications.*