XI International Conference on Coupled Problems in Science and Engineering, COUPLED 2025
May 26-29, 2025, Villasimius, Sardinia, Italy

HIGH-ORDER AND INNOVATIVE METHODS FOR COUPLED PROBLEMS IN LIFE SCIENCE AND GEOPHYSICS

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ABSTRACT

The numerical solution of coupled problems is challenged by the complexity of nature, where the interaction of several physical laws, objects with different materials and properties, and phenomena occurring on different spatial or temporal scales are common. In this context, adaptive and high-order discretization methods offer several key advantages. A first appealing feature of high-order schemes and general meshes is their arbitrary-order accuracy, which usually favors stable and robust designs.

Secondly, advanced numerical technologies in the context of coupled problems allows the adaptation of different polynomial degree and/or mesh type and size depending on the considered region of the physical space or the local PDE model.

Lastly, polytopal discretizations offer high flexibility to handle complex geometrical situations such as those arising from multiphysics, multiscale, mixed-dimensional, and interface problems.

This minisymposium is devoted to new and advanced strategies possibly based on high-order, adaptive or polytopal discretizations to address important challenges in the numerical solution of multi-physics problems. The applications of interest include (but are not limited to): i) modeling of the pathophysiology and functioning of biological tissues; ii) modeling of geological materials for sustainable use of subsoil; iii) multiphysics simulation in heterogeneous of fractured media; iv) fluid-structure interaction problems.