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MATHEMATICAL AND COMPUTATIONAL METHODS FOR SUBSURFACE MODELING AND VISUALIZATION

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ABSTRACT

With the rapid development of high-performance computing infrastructures, subsurface modeling and visualization has moved recently to the forefront of research in geophysics. Looking for an accurate characterization of the subsurface, modern approaches have been developed that are able to model geological structures with unprecedented resolution and detail. However, new challenges are demanding for the development of novel approaches to mathematically model the Earth's structure, the behavior of fluids in geologic formations, and groundwater aquifers.

For instance, an increased accuracy in characterization is yielding to the simulation of full viscoelastic and poroelastic wave propagation as well as to study the elusive physical interactions with electromagnetic, gravitational and hydrological processes. Similarly, the quest for the finest geological structure has posed the challenge of assimilating the smallest features such as fractures, faults, anisotropy and relief surfaces within the seismic models. All these challenges lean on the adaptation of numerical solutions to computing infrastructure and the evolution of optimization techniques needed to select the best alternative solutions. Notably, current research in subsurface modeling draws from knowledge in Mathematics, Geophysics and Computer Sciences that naturally thrives on interdisciplinary research collaborations. This Special Session looks for fostering collaboration in these areas.

This session will present new developments in numerical methods for subsurface modeling and visualization from an interdisciplinary perspective, covering the computational, geophysical and mathematical aspects. The topics of the presentations include novel methods, applications, and accuracy, stability and convergence analyses.