Advancements in multi-scale, multi-physics computational methods for heterogeneous porous media

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Heterogeneous porous media are present in diverse natural and engineering systems, ranging from biological tissues and geological formations to ceramics and foams. These systems exhibit inherent multi-scale characteristics, spanning a wide range of spatial scales. Porous materials are also known for their distinctive properties such as low resistivity, thermal conductivity, and density just to name a few. In most porous systems, the functionality of the material is influenced and controlled by the movement of fluids, solutes, particles, electrical charges, and heat through their porous network. Understanding the physical, chemical, thermal, and biological processes within these porous systems, including fluid flow, diffusion, dissolution, degradation, shrinkage, fracturing, and electrical charges, is crucial for understanding their response to different loading conditions as well as optimizing their performance. However, the presence of diverse pore structures with different geometrical shapes, orientations, and configurations across various length scales presents challenges in numerically characterizing these systems. This session invites scientific and engineering contributions to this field by improving or developing computational methods, including but not limited to:

- modeling Thermo-Hydro-Mechanical-Chemical processes in porous media
- poro-mechanical coupling schemes
- multi-scale modeling method for fracture in porous media
- data-driven modeling and computation in porous media
- integration of experiments and modeling

We specifically invite participation from undergraduate and graduate students, postdocs, early careers, and individuals from minority backgrounds to share their research outcomes and contribute to a more inclusive session.