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MULTISCALE COMPUTATIONAL APPROACHES FOR GEOMECHANICS

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ABSTRACT

Current computational developments in geomechanics are motivated by many environmentally critical applications such as energy resources recovery, geologic sequestration CO_2, nuclear waste disposal, or groundwater-borne reactive pollutant dispersion in the geosphere, among others. To develop reliable solutions to these problems, it is necessary to address multi-physical couplings between mechanical, hydraulic and thermal processes, which can be extended to include chemical and biological phenomena. For instance, the porous fabric of geomaterials can experience micro-mechanical damage due to transport of reactive fluids that can lead to changes in the deformability, strength and permeability characteristics.

Important efforts have been devoted in recent years to advance the theoretical concepts for constitutive modeling, computational developments, and laboratory techniques, as well as in the detailed examination of well documented field cases. Multi-scale multi-physics modelling has become an increasingly important field of research for examining complex nonlinear constitutive phenomena. The alterations in the properties of the porous geomaterials result from actions at various scales of interest. Multi-scale methodologies are therefore the subject of intensive developments for geomechanical applications in order to account for phenomena taking place at a scale below the characteristic dimensions of a problem.

The proposed mini-symposium will provide a forum for presentation and discussion of recent advances in computational geomechanics. An emphasis will be on computational methods involving multi-scale aspects in a general sense (concurrent computing, domain

decomposition, computational homogenisation, micro-mechanically motivated constitutive modelling, ...).
Contributions are solicited in (but not limited to) the following modeling and simulation areas of Geomechanics:

- Computational modelling of the behavior of unsaturated soils and rocks
- Thermo-hydro-chemo-mechanical processes in soils and rocks
- Homogenization methods for geomechanical problems with multiphysics
- Micromechanically-motivated constitutive modelling
- Degradation and instability modeling (localization, post-localization, ...)
- High Performance computing
- Practical applications related for instance to nuclear waste storage, CO2 sequestration or pollutant transport
- Multiphysics perspective of discrete to continuum transitions