Hydraulic, thermal, chemical and mechanical processes in porous and fracture media, with special emphasis on urban groundwater and geothermal energy

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Hydraulic, thermal, chemical and mechanical processes (coupled or uncoupled) in saturated media are of increasing interest in many hydrogeological contexts and their understanding is a major challenge in modern hydrogeology. These processes play a major role in natural systems, such as in thawing rock and soil and volcanic environments, but also in anthropogenic systems where human activities are intensifying the pressure on groundwater and subsurface space use. The understanding of these processes is of paramount importance to:

- Ascertain the role of groundwater in the context of geothermal energy and mitigating its impacts. It is also needed to consider the seasonal and long-term development of thermal and mechanical conditions in aquifers, heat transfer across aquifer boundaries and between fluid and rock are focus points, and the influence of precipitated fluid compounds.
- Enhance the development of underground constructions improving its efficiency and minimizing impacts.
- Achieve an accurate characterization of subsurface flow, transport and heat transfer, which require observations of induced or natural variations of the thermal regime. There are many ongoing research projects studying heat as a natural or anthropogenic tracer, for characterizing aquifers, flow conditions, and crucial transport processes, such as mechanical dispersion.
- Determine the fate and evolution of pollutants and micropollutants introduced in natural systems by the leakage from sewers and the discharge of wastewaters.
- Explain the influence of urbanized areas and sealed surfaces in the aquifer behavior.
- Improve predictions concerning groundwater extraction, injection and/or both, and their associated impacts.
- Understand the consequences and risks associated with CO_2 storage.
- Identify and quantify aspects that may impact the urban groundwater and investigate methods for minimizing their influence (e.g., artificial groundwater recharge, improvement of the “natural” recharge in urban areas, reuse of pumped groundwater, redesign of geothermal systems, etc.) and to enhance groundwater management strategies.

This session welcomes contributions that deliver new insight in the field of hydraulic, thermal, chemical and mechanical processes in saturated media, specially, but not restricted to, in urban aquifers, including experimental design, reports from new field observations, demonstration of sequential or coupled physical and numerical modeling concepts or case studies.