Proposal of an Invited session for COMPLAS 2023.

CRACKS AND DISCONTINUITIES in QUASI-BRITTLE MATERIALS SUBJECT TO COUPLED PROCESSES, INCLUDING DURABILITY MECHANICS AND HYDRAULIC FRACTURE

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Cracks and discontinuities play a fundamental role in all aspects of the behaviour of quasi-brittle materials such as concrete and rock, and their complete understanding and accurate modelling is, to date, still an open challenge.

Beyond certain threshold of mechanical loading these materials may develop distributed micro-cracks, some of which may eventually coalesce into localized macro-cracks while the rest unload. But degradation may be caused as well by environmental loading, and the effect of the latter may be crucial because of the interaction effects between the environmental reactive transport phenomena such as moisture movement, radiation or chemical activity, and the mechanical response and the cracking. In a similar way, pressurized fluid flow though the material porosity and the cracks, may generate crack propagation and lead to strong coupling.

A proper understanding and assessment of all these phenomena require multi-physics sound models, which include mechanical and the flow/diffusion/reaction/transport behavior, in general considering the time variable as well. The highly heterogeneous nature of quasi-brittle materials may also play a key role in deterioration studies. In that case, multi-scale models, such as micro- or meso-mechanical models, where the heterogeneities are explicitly described, may help to simplify considerably the constitutive description, at the cost of a higher computational effort, which in turn may require parallel high-performance computing.

This mini-symposium is intended to gather contributions on all those and related topics, including mainly numerical modeling, but also related experimental and theoretical studies. Classical models based on a continuum or a discrete approach, as well as more recent techniques such as XFEM, phase field, etc. are welcome.