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RECENT ADVANCES IN COUPLED PLASTICITY AND DAMAGE: PHYSICS-BASED, DATA-DRIVEN AND MULTISCALE APPROACHES

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ABSTRACT

Recent advances in computational mechanics have significantly enhanced the fidelity of models for inelastic deformation, damage evolution, fracture, and failure in engineering materials and structures. This is especially timely given the rapid proliferation of architected metamaterials and lattice structures, where the interplay between geometric design and inelastic response opens new and largely uncharted territory for computational damage mechanics. This invited session aims to provide a forum for contributions on coupled plasticity and damage, with an emphasis on physics-based, data-driven, and multiscale approaches. The scope includes constitutive modelling, multiscale and multiphysics simulation, inverse problems, scientific machine learning, reduced order and surrogate modelling, and advanced discretization methods.

The session welcomes both fundamental and application-oriented studies, including work connected to experiments, digital twins, and industrial simulation.

Topics of interest include, but are not limited to, the following:

- Physics-based and data-driven modelling strategies
- Coupled plasticity and damage constitutive models
- Fracture, failure, and degradation across scales
- Multiscale and multiphysics approaches
- Scientific machine learning and surrogate modelling
- Inverse problems and parameter identification