XIX International Conference on Computational Plasticity, COMPLAS 2027
September 6-10, 2027, Barcelona, Spain

MODELLING OF FRACTURE AND FAILURE IN GEOPHYSICAL MATERIALS

ARIS TSAKMAKIS[*], ANNA TRAUTH[*]
AND RALF MÜLLER[†]

[*] Materials Mechanics Group, Technical University of Darmstadt
Franziska-Braun-Str. 3, 64287 Darmstadt, Germany
tsakmakis@wm.tu-darmstadt.de

[†] Institute for Mechanics, Technical University of Darmstadt
Franziska-Braun-Str. 5, 64287 Darmstadt, Germany
ralf.mueller@mechanik.tu-darmstadt.de

ABSTRACT

Geophysical materials such as ice, snow, rock, and frozen soils play a central role in some of the most consequential natural hazards and climate-related processes of our time. The fracture of glaciers and ice sheets critically determines rates of sea-level rise, avalanche release mechanisms pose direct risks to mountain communities and infrastructure, and the failure of rock slopes and permafrost threatens both natural and built environments. Despite their importance, the computational modelling of failure in geophysical materials remains an open challenge, owing to their complex, rate- and temperature-dependent constitutive behaviour, multi-phase nature, and the vast range of spatial and temporal scales involved.

The objective of this invited session is to address modelling issues encountered in the mechanics and computational modelling of fracture and failure in geophysical materials, and to provide a platform for discussion of recent advances and open challenges in this field. Contributions addressing any aspect of failure in these materials are welcome, including, but not limited to,

- Damage and fracture mechanics for geophysical materials
- Constitutive modelling of multi-physically coupled processes in geophysical materials
- Multi-scale approaches and data-driven methods for failure in geophysical materials

The session aims to foster an interdisciplinary exchange between computational mechanics, geosciences, and natural hazard research, and to contribute to the development of predictive tools that address environmental and societal challenges.