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

RECENT ADVANCES IN FATIGUE AND PLASTICITY MODELLING OF METALLIC MATERIALS AND STRUCTURES

R. FINCATO*, S. TSUTSUMI†

* Padova University, Department of Civil, Environmental and Architectural Engineering
Via Marzolo, 9 - 35131 Padova, Italy
riccardo.fincato@unipd.it, valentina.salomoni@unipd.it

† The University of Osaka, Department of Naval Architecture and Ocean Engineering
2-1 Yamadaoka, Suita, 565-0871 Osaka, Japan
tsutsumi@naoe.eng.osaka-u.ac.jp

ABSTRACT

The study of the mechanisms governing fatigue crack initiation and propagation continues to represent a major research challenge, owing to its substantial implications for the economic impact, safety, and sustainability of both existing and future engineering structures and mechanical components.

This session addresses recent advances in fatigue and plasticity modelling of metallic materials and structures. Particular attention is placed on the role of local plasticity in fatigue crack initiation, damage accumulation and the transition from low-cycle to high-cycle fatigue regimes. Contributions are invited on cyclic hardening and softening, ratcheting, mean stress relaxation, local strain approaches, crystal plasticity, finite element implementation of constitutive models, and coupled crack initiation-propagation strategies.

The session welcomes both experimental and numerical studies, including material parameter identification, validation under strain-controlled cyclic loading, local fatigue indicators, residual stress effects, and applications to notched components, welded joints and structural details. The objective is to discuss how advanced cyclic plasticity models and local fatigue approaches can improve fatigue life prediction beyond conventional nominal stress-based methods.