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COMPUTATIONAL METHODS FOR METAL ADDITIVE MANUFACTURING

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ABSTRACT

Additive manufacturing (AM) of metals has become a key technology for advanced engineering applications, offering unprecedented design freedom and material efficiency. However, the complex thermo-mechanical phenomena involved, including melting, solidification, phase transformation, and residual stress development, demand accurate and efficient computational approaches for process understanding, optimization, and control.

This thematic session aims to gather contributions focused on the modelling and simulation of metal additive manufacturing processes, such as Powder Bed Fusion (PBF), Directed Energy Deposition (DED), and wire-arc AM. Topics of interest include, but are not limited to: high-fidelity multiphysics simulations of melt-pool behaviour, thermo-mechanical and metallurgical modelling, reduced-order and data-driven approaches, process–structure–property relationships, and numerical methods for defect prediction and distortion compensation.

The session seeks to foster discussion among researchers and engineers developing innovative computational tools and simulation frameworks that bridge the gap between fundamental process physics and industrial applications of metal AM.