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MULTISCALE AND MULTIPHYSICS MODELLING APPROACHES OF ADDITIVE MANUFACTURING IN ENGINEERING APPLICATIONS

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ABSTRACT

Additive manufacturing (AM) has enabled to produce components of complicated shapes which are impossible by conventional techniques such as casting, forging or machining. However, the design of fabrication processes requires careful multiscale considerations since the scan strategy induces variations in the final quality due to multiphysics factors such as thermal history, microstructure development, defects generation/suppression and so on, even though the final component shape is the same. As AM applications are widely expanding, the control of process-induced quality variation is an important topic in many sectors such as aerospace, automotive, biomedical, nuclear engineering and others.

This session provides a discussion platform for researchers and engineers who are interested in AM process designs and mechanical properties over a wide range of scales and physical processes. Especially, topics close to real applications are welcome, such as aircraft, spacecraft, rockets, automobiles, implants, turbomachinery for energy, and others, where according to the target phenomenon, high-fidelity simulation or reduced order simulation may be selected, making a balance between the accuracy and computational cost. Modelling approaches ranging from multiphysics modelling to data-driven modelling, but not limited to, including computational fluid dynamics, finite element method, machine learning, data-driven approach, and any others are also welcome. Optimisation methods can be also highly appreciated, which can be applied to process conditions, defects control, geometry tuning, or others.

The materials are not limited to metals, but also other materials are welcome such as ceramics. It should be a good opportunity to exchange ideas and findings in an interdisciplinary manner to enhance our understanding in phenomena in multiple scales for improved processing performance in AM.