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INDUSTRIAL APPLICATIONS OF SIMULATION FOR ADDITIVE MANUFACTURING: FROM RESEARCH MODELS TO PRODUCTION DECISIONS

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ABSTRACT

Simulation tools that predict temperature fields, residual stresses, distortions, and defect-prone regions at the part scale are increasingly used in industrial additive manufacturing (AM). Nevertheless, the step from a validated research model to a tool that reliably supports decisions in an industrial environment is often larger than anticipated. Users face frequently changing geometries, a variety of machines and materials, tight time windows during the build preparation, and limited budgets for the model calibration. The decisive question is therefore whether a model is accurate, fast, and robust enough for the respective decision, e.g., on the build orientation, the support layout, the pre-deformation of the geometry, or the release of a build job.

This Invited Session brings together researchers, software developers, and users from industry to discuss where simulations already support decisions in production and where their limits lie. Topics include, but are not limited to:

- Industrial case studies, e.g., from the aerospace, energy, medical, and automotive sectors
- Selection of an adequate model fidelity and computational effort for the industrial question at hand
- Integration of simulation tools into the digital process chain, from the build preparation to the post-processing
- Calibration and validation of models with production data and their transferability across machines, materials, and geometries
- Transfer of research models into robust and usable software, including the joint development by academia and industry
- Deployment of reduced-order and data-driven models in production environments
- Economic benefits and lessons learned from cases in which simulations fell short

Contributions addressing all AM processes are welcome. Joint contributions from academic and industrial partners are particularly encouraged.