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COUPLING FULL-FIELD MEASUREMENTS AND COMPUTATIONS: MATERIAL CHARACTERISATION AND MODEL IDENTIFICATION

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ABSTRACT

Recent approaches in material and structural mechanics aim at coupling advanced experiments with mechanical modeling and simulations, in order to increase measurement accuracy and resolution and/or to detect features so far neglected. These strategies turn out to be especially useful in the presence of complex nonlinear phenomena, such as delamination, damage, thermo-mechanical coupling, fracture, which are intrinsically multi-scale. Advanced mathematical models for material mechanics contain numerous parameters, many of which are difficult to estimate or even do not possess a clear physical meaning. Therefore, these parameters have to be identified simultaneously on the basis of experimental data, through suitable identification techniques.

In modern approaches, the data space for calibration and validation is expected to include multi-field measurements (e.g, via X-ray computed tomography, thermography, optical measurements, mechanical strain gages). Recent advances in experimental mechanics allow nowadays to design innovative tests both in the laboratory or in situ, at different observation scales. Inverse methodologies can thus be developed by combining synergistically the experimental information provided by multi-sensor experiments, computer simulations and specific identification procedures. The final purpose is to improve the resolution/accuracy of experimental measurements by multi-field and multi-scale coupling,

and the calibration/validation process of predictive models for material and structural mechanics, in view of their effective application to industrial problems.

The Mini Symposium will include the following topics: (i) innovative tests and non-conventional measurement techniques for solids and fluids (2D and 3D digital image and volume correlation, interferometry, X-ray tomography, X-ray diffraction, IR thermography); (ii) analyses by advanced numerical models; (iii) robust identification procedures, especially conceived for full-field measurements.

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