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REDUCED ORDER AND SURROGATE MODELING FOR UNCERTAINTY ANALYSIS IN STRUCTURAL MECHANICS

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ABSTRACT

The engineering community has widely acknowledged and accepted the importance of accounting for the effects of uncertainty on the performance of structural systems. However, explicit quantification of the uncertainty is an extremely challenging task as usually, the performance of structural systems is characterized by means of highly refined numerical models. This prevents the direct application of most approaches for uncertainty propagation, as they demand performing repeated structural analyses. A possible means for circumventing this issue is resorting to reduced order or surrogate models. These models are capable of capturing – up to some extent – the dependence of the performance of a structural system with respect to uncertain parameters while demanding considerably less numerical effort, thus offering a feasible means for performing uncertainty analysis in practice.

The aim of this mini-symposium is addressing the very latest development on approaches for reduced order and surrogate models for uncertainty quantification in structural mechanics. The scope of the mini-symposium is broad, as it includes various models for representing uncertainty (such as classical probabilities, intervals, fuzzy analysis, imprecise probabilities, etc.); different types of structural problems (linear or nonlinear, static or dynamic); development of novel meta-models; and practical applications of methods for reduced order and surrogate models in uncertainty quantification comprising, e.g. robust design, reliability-based design, multi-objective optimization, life-cycle optimal design, sensitivity analysis, etc. Both theoretical developments and practical applications involving systems of engineering interest are particularly welcomed in this session.