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UNCERTAINTY QUANTIFICATION IN COMPUTATIONAL MECHANICS: PROBABILISTIC AND NON-TRADITIONAL APPROACHES

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ABSTRACT

In the last decades, the engineering community has widely acknowledged the importance of accounting for the effects of uncertainty on the performance of engineering systems. However, explicit quantification of the uncertainty is an extremely challenging task. On one hand, the behaviour of most engineering systems is characterized by means of highly refined computational models whose numerical solution is demanding. On the other hand, the definition of appropriate models for describing uncertainty is far from trivial, particularly on those situations where there is lack of data, vagueness or imprecision. Hence, the development of methods for uncertainty quantification in computational mechanics has received much attention lately, with emphasis on: (a) numerical efficiency and (b) proper representation of uncertainty by means of both probability theory and non-traditional approaches (such as intervals, fuzzy analysis and imprecise probabilities).

The aim of this mini-symposium is addressing the very latest development on approaches for uncertainty quantification on computational mechanics, including both probabilistic and non-traditional approaches. The scope of the mini-symposium is broad, as it covers: different models for representing uncertainty such as classical probabilities, intervals, fuzzy analysis, imprecise probabilities, evidence theory, etc.; novel approaches for uncertainty quantification applying meta-models (kriging, Gaussian processes, polynomial chaos, etc.), approximate or closed analytical solutions, advanced simulation methods, etc.; and practical applications of methods for uncertainty quantification such as robust design, reliability-based design, multi-objective optimization, life-cycle optimal design, sensitivity analysis, etc. Both theoretical developments and applications involving systems of engineering interest are particularly welcomed in this session.