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BAYESIAN UNCERTAINTY QUANTIFICATION AND MODEL SELECTION FOR COMPLEX FLUIDS

Aricia Rinkens[1], Clemens V. Verhoosel[1,*] and Nick O. Jaensson[1]

[1] Eindhoven University of Technology, Department of Mechanical Engineering,
PO Box 513, 5600 MB, Eindhoven, The Netherlands
{c.v.verhoosel@tue.nl, n.o.jaensson@tue.nl}

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Complex fluids – such as polymeric liquids, foams and particle suspensions – are materials with a microstructure, of which the consitutive behavior depends on the loading of the material. The selection and calibration of constitutive models for such fluids can be a daunting task, and the model behavior in complex flow situations can be unpredictable a priori.

In this contribution we present a Bayesian approach to model calibration [1]. In the context of complex fluids, this approach has been considered in Ref. [2] for generalized Newtonian fluids. Our work considers Bayesian uncertainty quantification for yield stress fluids (*e.g.*, Bingham fluids). Besides the calibration of such models based on experimental (and synthetically created) data, we also consider model selection as part of the uncertainty quantification procedure, targeting the determination of the calibrated model that best fits the data.

Our approach is based on the Markov chain Monte Carlo method [3], which, given a prior probability distribution of the model paramters, samples the posterior distribution based on a likelihood function quantifying the resemblance between model realizations and the available data. Driven by the fact that in many practical situations the evaluation of the model can become computationally demanding, our work has a strong focus on understanding and controlling the accuracy of the uncertainty quantification procedure.

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