6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 15 June 2018, Glasgow, UK

VARIATIONAL UPDATES FOR STRONGLY COUPLED THERMOMECHANICAL PROBLEMS INCLUDING MASS TRANSPORT

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Key words: *Variational updates; coupled problem; thermomechanics*

Variational update formulas have proven an effective method for developing robust integration algorithms in nonlinear solid mechanics of dissipative media. Many reference describe such methods for constitutive models such as elastoplasticity, viscoelasticity, damage, etc. See, among others, [1, 2].

The extension of variational updates to thermomechanical problems is much more involved and only after the pioneering work of Yang *et al.* [3] these kind of methods could be extended to coupled systems. In this key reference, and in order to recover a variational statement of the equations, it was necessary to introduce an artificial time re-scaling. Later methods also inherit this scaling in their formulations [4].

In the current work we describe a novel variational update that simplifies and extends the formulation of Yang *et al.*. First, it simplifies the existing formulation showing that an alternative choice of the thermodynamic forces makes the time re-scaling unnecessary. Also, it extends previous formulations because we are able to include mass transport in the same framework, making the three-field rate problem completely variational. Numerical simulations will be shown to illustrate the performance of the proposed method.

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