

# A projection-based model reduction method for nonlinear mechanics with internal variables: application to thermo-hydro-mechanical systems.

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## ABSTRACT

We propose a projection-based monolithic model order reduction (MOR) procedure for a class of problems in nonlinear mechanics with internal variables. The work is motivated by applications to Thermo-Hydro-Mechanical (THM) systems for radioactive waste disposal. THM equations model the behaviour of temperature, pore water pressure and solid displacement in the neighborhood of geological repositories, which contain the radioactive waste and are responsible for the thermal flux. For this class of problems, we develop an adaptive sampling strategy based on POD-Greedy sampling, and we develop an element-wise empirical quadrature hyper-reduction procedure to reduce assembling costs. We present numerical results for a finite element (FE) two-dimensional THM system to illustrate and validate the proposed methodology.