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BAYESIAN UPDATING OF EXISTING CONCRETE GRAVITY DAMS MODEL PARAMETERS USING STATIC MEASUREMENTS

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Dams are fundamental infrastructures in every country around the world, due to their use for energy production, flood control and agricultural-industrial sustenance. Most of the dams are designed before the introduction of seismic regulation, without concerns about their dynamic behaviour, then, in the recent years, the scientific community is paying close attention to the seismic risk of existing dams [1].
Concrete gravity dams have never failed after earthquakes, then in absence of case studies, their seismic behaviour can be explored and investigated using numerical approaches only. For this reason, finite elements models must be calibrated through reliable procedures in order to obtain a sensible result and, in this scenario, measurements acquired by monitoring system and data from in-situ tests take on a major role as important sources of information.
Methods that are usually employed for this purpose require a low computational burden, but they are characterised by a high level of uncertainty [2]. Probabilistic methods may be suitable to solve this inverse problem, but always require high computing power, due to the number of analyses to be performed, especially when stochastic finite elements are involved.
In this paper, a procedure for the model parameters calibration working in a Bayesian context is proposed [3]. The novelty of this study is the use of a proxy model [4] replicating the mechanical behaviour of the dam, so reducing the computational burden. The presented approach allows estimating the global model error as well, which is composed by the measurement error, the finite element model error and the approximation error.
Two models, a single monolith and a complete 3D model, of a large Italian dam have thus been considered and, by comparing the errors resulting from the different approaches, the best model simulating the observed behaviour of the dam has been selected, so evaluating the efficiency of the proposed methodology.

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