

## **INTERACTIVE INVERSION IN GEOLOGICAL APPLICATIONS**

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A standard goal in geology is to unravel the geological history of a region. This is often crucial to understanding its potential economic value. In general, this is equivalent to determining the initial conditions that generated a certain process, from its final configuration. Many similar problems are encountered in applied mathematics and engineering, under the name of inversion. In the last years, we witnessed the development of quite sophisticated forward modelling of geological processes. However, such forward models are used in a traditional trial-and-error fashion. Here we present a first step in the development of a system for interactive inversion of geological processes. In geology often we do not have numerical measures that are representative enough to establish the appropriateness of a geological model. The approach we propose is based on the use of an Interactive Genetic Algorithm in which the quality of a solution is input by an expert geoscientist according to his/her experience and a priori knowledge. This has been applied to the study of thermal convection in the Earth mantle. The main aim of this interactive approach is 1) to allow a more systematic and fast application of geological forward modelling codes, 2) to provide a formal role for 'a priori' knowledge coming from the geoscientist's experience into the inverse process and 3) to use the stochastic behavior of Genetic Algorithm to suggest valid solutions falling outside the range of the geoscientist's original expectation.