MODEL IDENTIFICATION FOR APPLIED GEOLOGY RELATED PROBLEMS

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Predicting responses of geological surroundings to natural and man-made impacts by solving pertinent differential and integral equations plays a considerable part in decision making related to geological engineering and environmental projects. However geological data on properties of the geological structures are sparse. To compensate for the paucity of the data, geological models, the simplified version of actual geological sites, substitute for those cites. To use the models, properties of their parts (blocks) must be assigned. One of the most common and reliable methods to do this is solving so called coupled problems. That is, parameters of a predictive model are assigned as solutions of pertinent inverse problems, called also model identification, model calibration, historical matching. However, the formulations of predictive models usually differ from interpretation models with respect to boundary conditions, monitoring time and space network and goal functions. It is also well known that model identification depends on how the problem of identification is formulated (so called problem-dependence of model identification). So, the model parameters which are the best during identification may not and often are not the best in prediction. To alleviate the situation a two-level modeling approach is suggested which is focussed on exploring how the properties of particular geological bodies affect the effective model parameters. It permits to find out when there is a need to correct the model parameters and how to do it. The approach is a kind of the Monto Carlo simulations. But its goal is investigation of how a simplified model represents different and more complex real worlds. The approach requires numerous solving of forward and inverse problems. A special numerical method for fast solving the inverse problems was developed.