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Subsurface modeling is a key tool to describe, understand and quantify geological processes. As the subsurface is inaccessible and its observation is limited by acquisition methods, 3D models of the subsurface are usually built from the interpretation of sparse data with limited resolution. Therefore, uncertainties occur during the model building process, due to possible cognitive human biais, natural variability of geological objects and intrinsic uncertainties of data. In such context, the predictibility of models is limited by uncertainties, which must be assessed in order to reduce economical and human risks linked to the use of models.
This work focuses more specifically on uncertainties about geological structures. In this context, a stochastic method is developed for generating structural models with various fault and horizon geometries as well as fault connections. Realistic geological objects are obtained using implicit modeling that represents a surface by an equipotential of a volumetric scalar field. Faults have also been described by a reduced set of uncertain parameters, which opens the way to the inversion of structural objects using geophysical data by baysian methods.