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# 3D modeling of fractured geological system – technique and numerical results

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To simulate processes occurring in fractured geological systems it is essential to capture the coupling of different active mechanisms within their realistic three dimensional geological environments. This is particularly the case for geothermal applications since many geothermal reservoirs form in faulted and fractured geological systems. One of the main challenges in modelling processes occurring in fractured rocks is related to the way of describing the heterogeneities of these systems. The representation of realistic three-dimensional geological environments is limited by the complexity of embedded fractured network. This often results in oversimplified models of the natural systems. The present paper gives a detailed technical description of an improved method which integrates generic dipping structures into a 3D porous medium. The automated mesh generation algorithm is composed of various existing routines from computational geometry (e.g. projection, interpolation, intersection and convex hull calculation) and meshing (e.g. triangulation in 2D and tetrahedralization in 3D). Additionally, the complete workflow is captured by open-source software. The described approach enables to simulate the coupling and interactions between discrete fractures and the rock matrix by means of finite element numerical techniques. The techniques and methods described in the paper can be applied for generic fractured porous media, including fault systems. Numerical simulations of coupled T-H processes are also presented to show the reliability and robustness of the method.