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A comparison of methods for the stochastic simulation of rock fractures. (English)

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Summary: Methods reported in the literature for rock fracture simulations include approaches based on stochastic geometry, multiple-point statistics and a combination of geostatistics for fracture density and object-based modelling for fracture geometries. The advantages and disadvantages of each of these approaches are discussed with examples. By way of review, the authors begin with the geostatistical indicator simulation method, based on the truncated-Gaussian algorithm; this is followed by multiple-point statistical simulation and then the stochastic geometry approach, which is based on marked point process simulation. A new approach, based on pluriGaussian structural simulation, is then introduced. The new approach incorporates in the simulation the spatial correlation between different sets of fractures, which in general, is very difficult, if not impossible, to accomplish in the three methods reviewed. Each simulation method is summarised together with detailed simulation procedures for each. A published two-dimensional fracture dataset is used as a means of assessing the performance of each simulation method and of demonstrating the concepts discussed in the text.

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74L10 Soil and rock mechanics

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Stochastic rock fracture simulation; Indicator simulation; Marked point processes; Multiple-point statistics; pluriGaussian simulation

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