Application of multiple-point geostatistics on groundwater flow and transport in media with complex geological heterogeneity: lessons learnt and remaining challenges

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Multiple-point geostatistics has been increasingly applied on groundwater problems in the last ten years. Several case studies have been published indicating simulating realistic geological heterogeneity using multiple-point geostatistics can significantly improve groundwater flow and solute transport predictions. There are however several remaining challenges when applying multiple-point geostatistics to groundwater problems often suffering from data scarcity. These challenges might be the reason why multiple-point has been used to a much lesser extent by practitioners than by researchers. This paper gives an overview of the current challenges and discusses new advancements to overcome them. The following questions will be discussed: How to obtain 3D training images? Can the representativity of the used training image be validated ? How sensitive are groundwater calculations to the selection of the training image? Is it worth incorporating fine scale geological heterogeneity in groundwater problems or are other features (boundary conditions, data uncertainty/quality, ...) more important for improving predictions? How can multiple-point geostatistics be used without suffering from very long computation times for the numerical models? Is overparametrization of groundwater models an issue ? What are the practical obstacles to apply multiple-point geostatistics by groundwater practitioners?