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# Chaotic flows as a tool to control preferential paths in heterogeneous porous media

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The engineered injection – extraction (EIE) system through multiple wells was born with the idea to promote the mixing and therefore the chemical reactions and the dilution in aquifers. But EIE has been mostly numerically tested in multigaussian fields, which is the standard geostatistical field to describe the heterogeneity of the porous medium and therefore the spatial distribution of the logarithm of the hydraulic conductivity (K). However, this geostatistical model does not take into account the hydraulic connectivity of high-K zones, grouping the extreme values into disconnected bodies and only connecting structures of intermediate-K values. On the other hand, non-multigaussian fields can generate geological bodies of extreme K values that concentrate flow and induce channeling. It turns out that, in real life, in situ remediation methods (e.g. injection of a treatment solution) are usually inefficient due to the presence of preferential paths generated by the heterogeneity of the porous medium, resulting in isolated low-K zones inaccessible to the treatment solution. In this work, we propose to use the chaotic flow, induced by the EIE, as a tool to break these preferential paths, making the aquifer behave as a chemical reactor in the zone enclosed by the wells. Importantly, if preferential paths can be controlled by using chaotic flow, the uncertainty of the remediation methods will be diminished. To study this, we compare the evolution of the dilution index obtained with multigaussian fields and with non-multigaussian fields of similar statistical properties.