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GROWTH OF MIXING LENGTH FOR THE TRACER FLOW PROBLEM IN A LONG-CORRELATED PERMEABILITY FIELD USING THE KARHUNEN-LOÈVE DECOMPOSITION APPROACH

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Summary. The spatial variations in porous media (aquifers and petroleum reservoirs) occur at all length scales (from the pore scale to the reservoir scale) and are incorporated in the governing equations on the basis of random fields (geostatistical models). As a consequence, the velocity field is a random function of space. The randomness of the velocity field gives rise to a mixing region between fluids, which can be characterized by a mixing length $l=l(t)$. Under very general hypotheses, the scaling behavior of the mixing region is related to the scaling properties of the geological heterogeneities through relation $l(t)\approx t^{\gamma}$, where $\gamma=\max\{1/2, 1-\beta/2\}$ and β is the Hurst coefficient. It gives a measure of relative importance of short *vs*. long length scale heterogeneities. In this work we use the theoretical result before to evaluate the representation of random fields using the Karhunen-Loève decomposition approach. For this we perform a numerical study for a statistical description of the mixing length, verifying the occurrence these scaling laws. The results shown that is necessary a large number of terms of the Karhunen-Loève to achieve a satisfactory approximation of the mixing length growth of the tracer flow in a fractally heterogeneous porous medium.