



## **Effective dispersion in seawater intrusion with application to a pumping well in a heterogeneous coastal aquifer**

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We study the effect of heterogeneity in the hydraulic conductivity field on the three-dimensional dynamics of seawater intrusion in a coastal aquifer with a pumping well. In order to test whether the mean behavior of this setup can be approximated with effective parameters we ran a Monte Carlo type series of numerical simulations. Variable-density groundwater flow and solute transport simulations were carried out within several random realizations of heterogeneous permeability fields. We determine the mean critical pumping rate by averaging over the ensemble of random conductivity fields and compare the result to the analytical solution derived by Strack (1976) for a homogeneous medium. Further, we evaluate the impact heterogeneity has on the seawater mass flux, the width of the mixing zone and the salinity of the water arriving at the well.

**Keywords:** Heterogeneity, coastal aquifer, seawater intrusion, variable-density flow, effective dispersion, critical pumping rate.