Contribution ID: **509** Type: **Poster (+) Presentation**

Estimation of auto-covariance of log hydraulic conductivity from Generalized sub-Gaussian porosity and particle size random fields

Tuesday, 1 June 2021 20:00 (1 hour)

Several techniques which are widely employed for the estimation of hydraulic parameters of aquifer systems are based on particle-size and porosity information. These rely on empirical formulations which are usually adopted to obtain hydraulic conductivity from quantiles of particle size curves and porosity. We present analytical formulations relating the spatial covariance of the (natural) logarithm of hydraulic conductivity and that of representative soil particle sizes and porosity, as embedded in the classical Terzaghi model. Our exact formulations are then approximated through perturbation methods to yield workable expressions embedding the relationship between the main geostatistical descriptors of sedimentological and hydraulic parameters of heterogeneous aquifer systems. We rest on a stochastic framework of analysis viewing a transformation of characteristic particle size (d10) and porosity as Generalized sub-Gaussian (GSG) spatially (cross-)correlated random processes. Typical low order statistics for d10 are determined for coarse sand using a global dataset of more than 400 unlithified samples from four different depositional environments. The accuracy of the resulting second-order (in terms of variance of porosity and characteristic particle diameter) model is assessed through a detailed suite of numerical Monte-Carlo analyses for typical values of estimated variance of porosity and d10. We find that our low order analytical approximation of log-conductivity covariance is characterized by a remarkable agreement against its Monte Carlo based counterpart also for highly heterogeneous settings considering either cross-correlated or independent transformed porosity and d10 bivariate distributions.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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