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stochastic estimation of transmissivity fields conditioned to flow connectivity data

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Most methods for hydraulic parameter interpretation rely on a number of simplifications regarding the homogeneity of the underlying porous media. This way, the actual heterogeneity of any natural parameter, such as transmissivity, is transferred to the estimated in a way heavily dependent on the interpretation method used. An example is a pumping test, in most cases interpreted by means of the Cooper-Jacob method, which implicitly assumes a homogeneous isotropic confined aquifer. It was shown that the estimates obtained from this method when applied to a real site are not local values, but still have a physical meaning; the estimated transmissivity is equal to the effective transmissivity characteristic of the regional scale, while the log-ratio of the estimated storage coefficient with respect to the actual real value (assumed constant), indicated by , is an indicator of flow connectivity, representative of the scale given by the distance between the pumping and the observation wells. In this work we propose a methodology to use together with actual measurements of the log transmissivity at selected points to obtain a map of the best local transmissivity estimates using cokriging. Since the interpolation involves two variables measured at different support scales, a critical point is the estimation of the covariance and crosscovariance matrices, involving some quadratures that are obtained using some simplified approach. The method was applied to a synthetic field displaying statistical anisotropy, showing that the use of connectivity indicators mixed with the local values provide a better representation of the local value map, in particular regarding the enhanced representation of the continuity of structures corresponding to either high or low values.