



Uncertainty propagation in up-scaling of subsoil parameters, no particular distributions required

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Introduction

All data obtained by observations are subject to uncertainty. This uncertain data can be described by probability density functions (PDF). Different types of data may have different shapes of PDFs. Our aim is to derive an uncertainty propagation method which does not depend on any particular distribution. We focus on the up-scaling of borehole data to be used in groundwater models.

Objectives

- Up-scale subsoil parameters
- Interpolate subsoil parameters
- Retain uncertainty information
- Independent of particular probability distributions

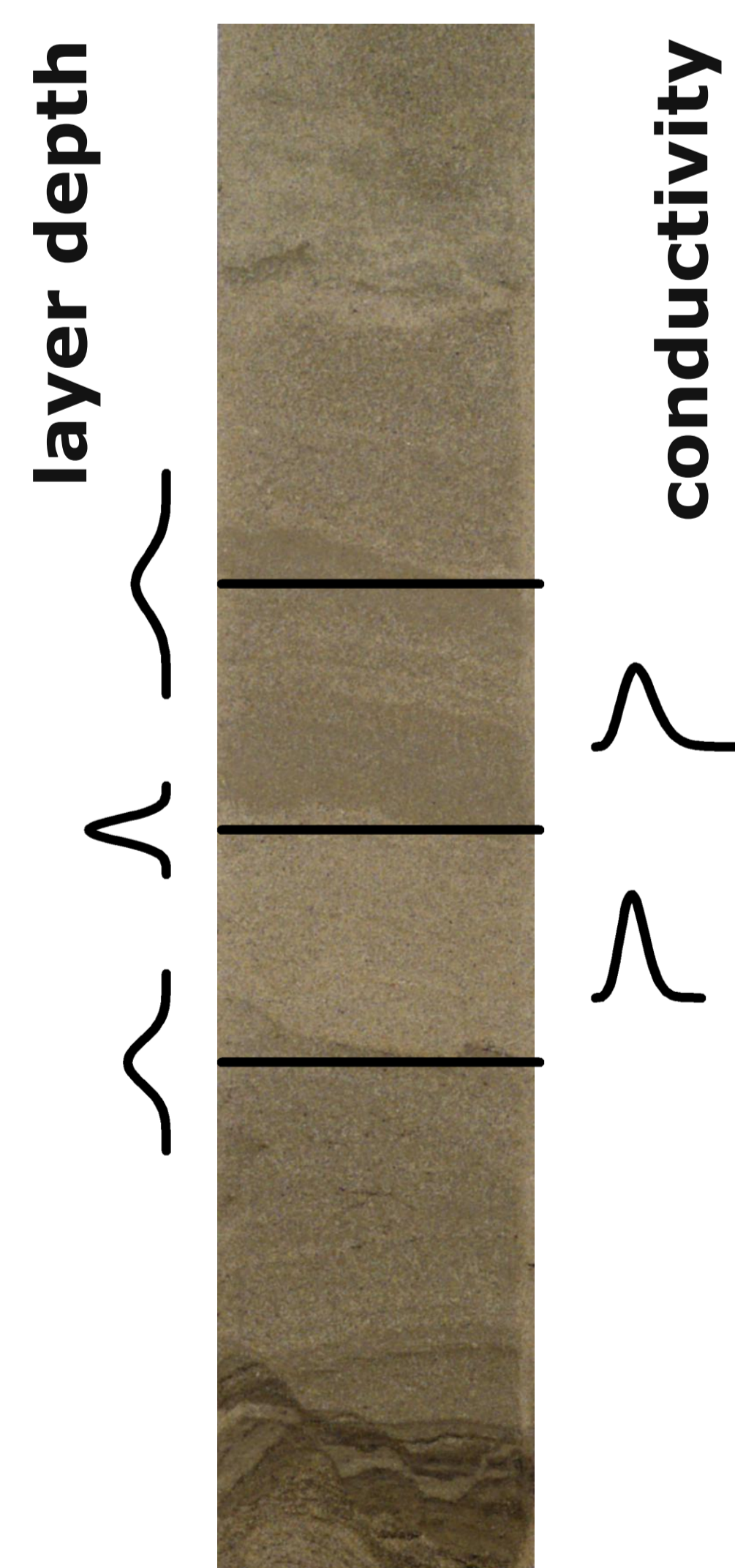
Methods

All uncertain data are described by piecewise linear PDFs. The developed method performs calculations with the complete PDFs. This method is incorporated in kriging interpolation and applied to borehole data. The used conductivity distributions of the borehole data are available from previous research.

Results

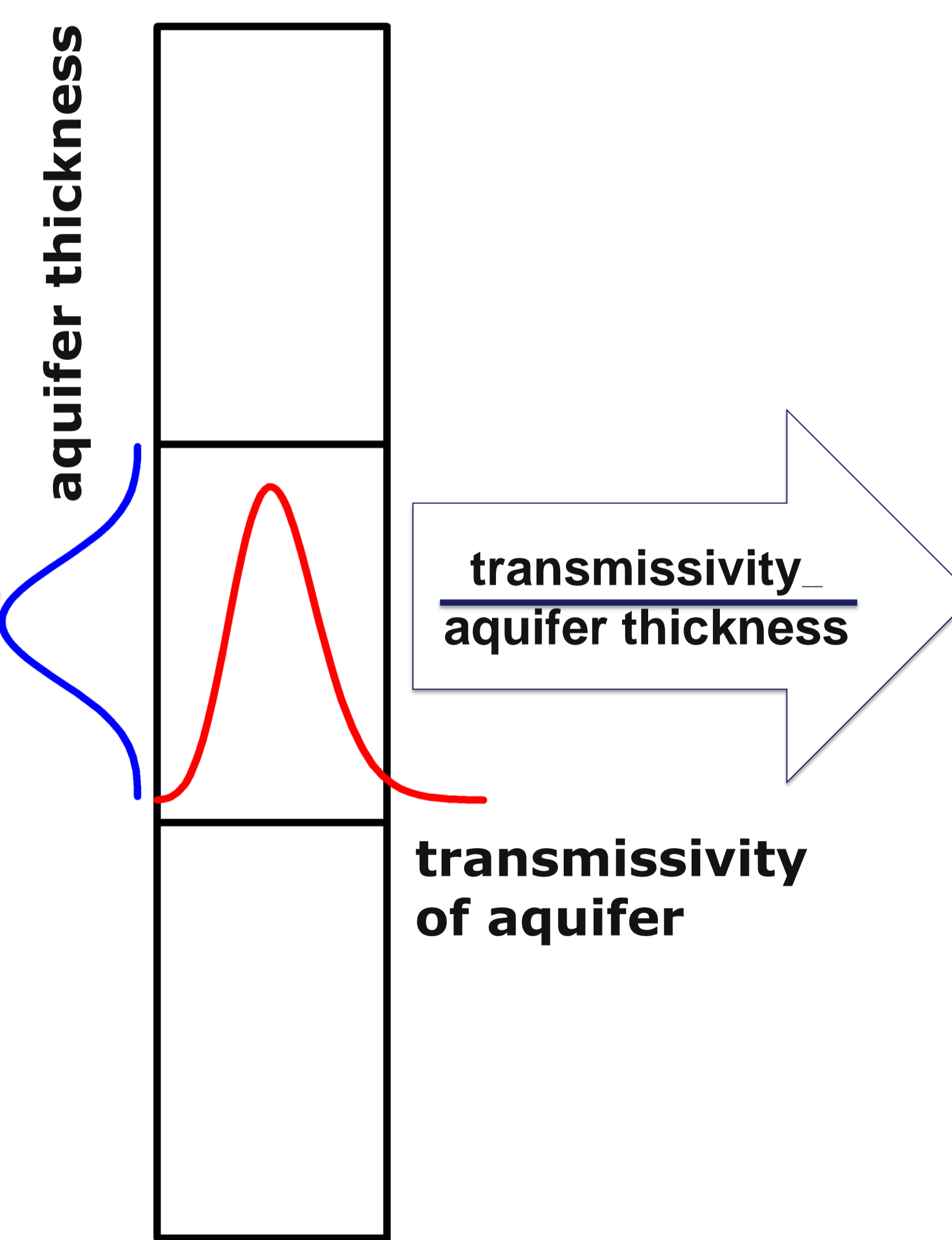
- Calculations with complete PDFs
- Applicable to any shape of distribution
- Complete PDFs of transmissivities at aquifer scale
- Advantage: the complete probability density is propagated in one step. No methods like Monte Carlo simulation needed.

Uncertainty of observations described by PDFs



up-scaling borehole data

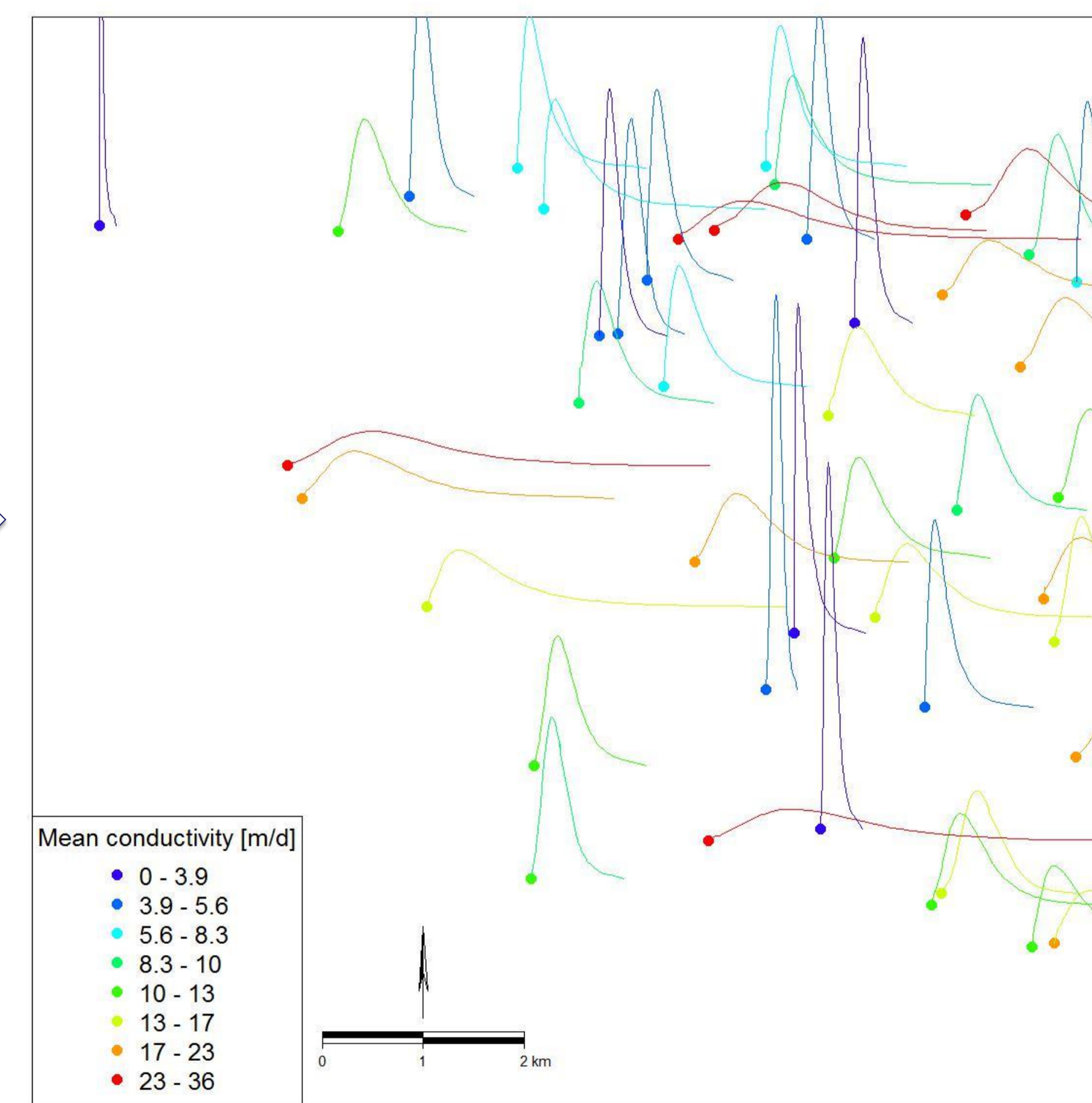
Up-scaled transmissivity at one borehole location



transmissivity / aquifer thickness

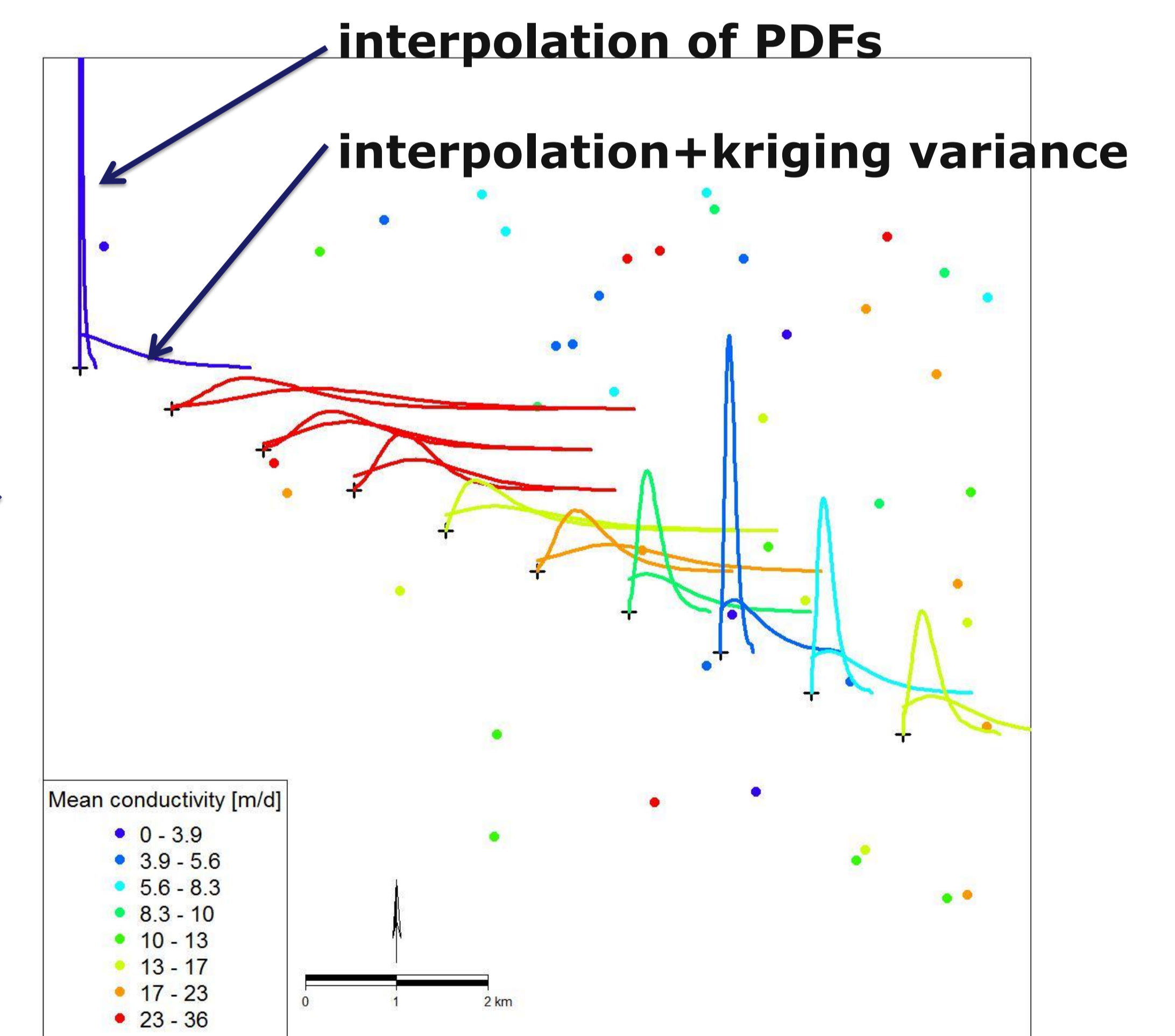
vertical up-scaling

Up-scaled conductivities at all borehole locations



kriging interpolation

Kriging interpolation of PDFs



horizontal up-scaling