

# Up-scaling subsoil parameters by propagation of the complete PDFs

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## Introduction

In groundwater modeling a spatial representation of the conductivity is needed. Usually, this is obtained by interpolation of known values at borehole locations. Since these observations are never exact they must be described by probability density functions (PDFs). We developed a method to propagate the uncertainty of observations to the spatial distributed parameter as complete PDF. The method is independent of the type of distributions used.

## Objectives

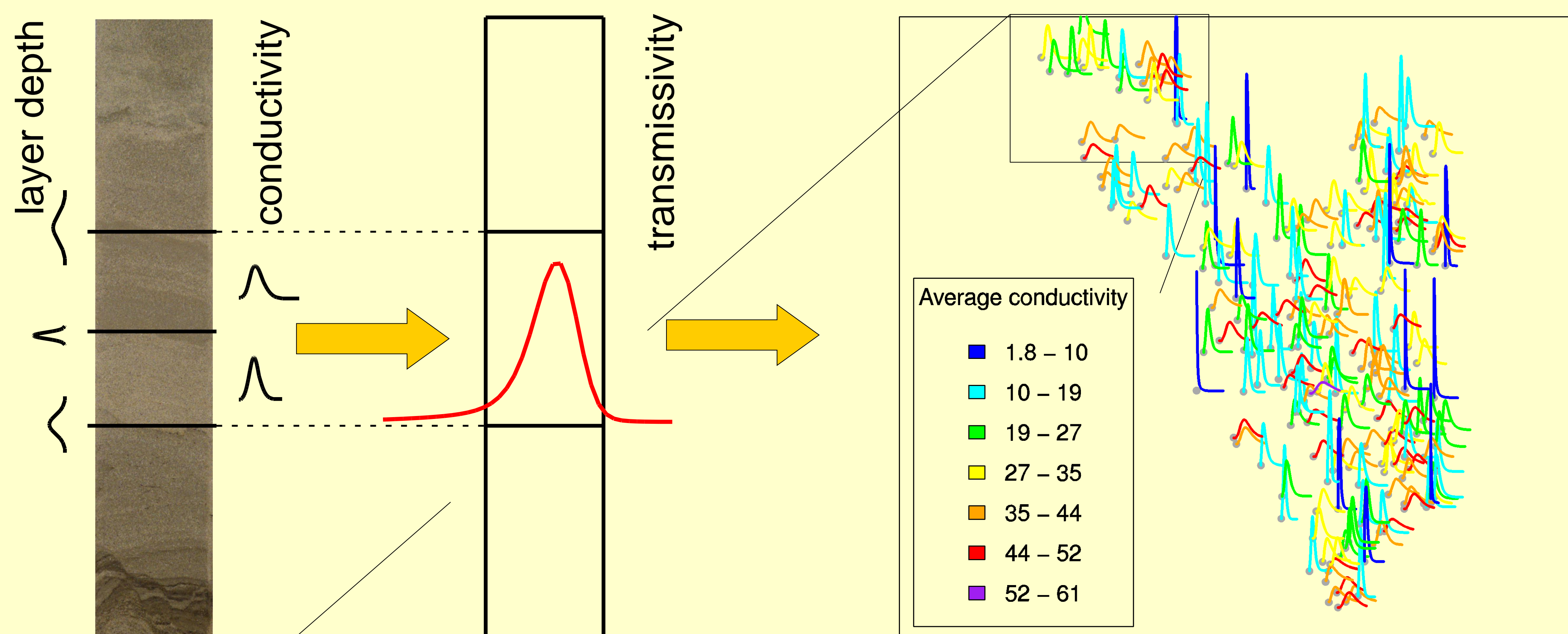
- Interpolation of transmissivities
- Propagation of complete PDF
- Distribution free method

## Methodology

All observations are described by piecewise linear PDFs. This holds for the conductivities as well for the layer depths. The uncertainty of the layer depths causes correlation between transmissivities of adjacent layers. The developed method accounts for these correlations. The conductivities are assumed to be log-normal distributed and the layer depths normal distributed.

## Preliminary results

### Step 1. Vertical up-scaling

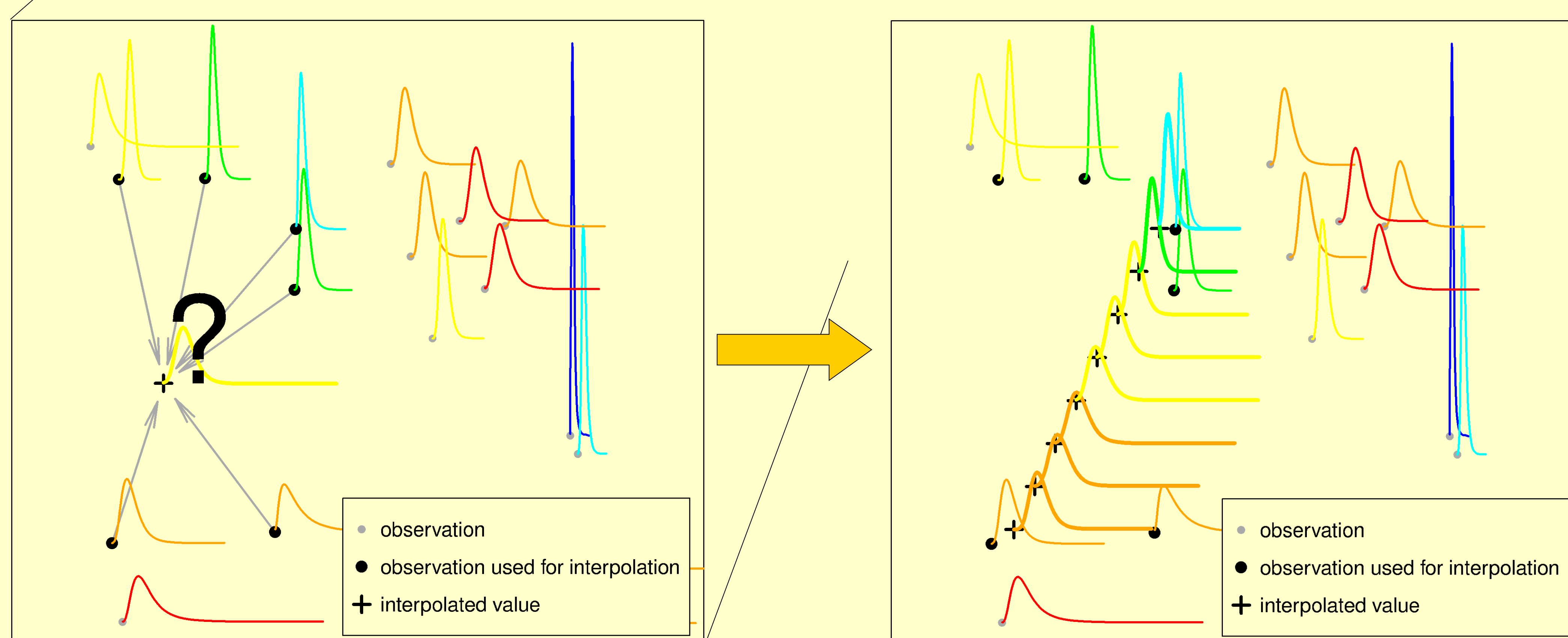


Up-scaling of multiple layers to one conductivity PDF at each bore hole location.

The color shows the **average conductivity** value of the PDF.

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### Step 2. Horizontal up-scaling



Using kriging for horizontal interpolation of the conductivity PDFs.

In this example only the six marked observations are used to perform the interpolations.

The variance of the interpolated PDFs increases clearly with the distance to the observation locations.