SUMMARY

When populating gridblocks in geo/reservoir models with petrophysical properties, it is clear that the first challenge is reproduce in the model the main trends that have been captured in the actual geology from data and knowledge. However, and while preserving these trends, distributing in the model correct values for properties is a key concern since no data can be acquired at the scale at which the data must be estimated or simulated.
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Usually, conventional data is available at wells, from logs interpretation or conventional core analysis in labs. However, the mean ratio between the volume at which the data is acquired (the point data) and the volume at which it has to be populated (the block data) is about 10^-6 to 10^-8. Obviously, upscaling the point data is definitively needed before populating the model, and leads to reduce the level of heterogeneity present in the data.

Concerning permeability, an evaluation of the property for an equivalent homogeneous medium can be available at a larger scale when a well test has been conducted in the reservoir. When permeability data is available at both scales, comparison of small scale values and large scale interpretation is usually run in order to calibrate the level of permeability in the model.

Finally, two series of concerns have to be faced for estimating conventional petrophysics at gridblock scale:
1. How small scale values of permeability from logs interpretation and core measurements compare with permeability estimation from well test interpretation? What can we learn from this comparison? What kind of match between data can we expect? and finally, what is a good match?
2. How to use small scale values for populating gridblocks? How to manage the change of support? Which parameters are influenced by the scale effect? What are the effects of change of support on representation of heterogeneity in the model?
Figure 2 Upscaling of a permeability distribution.