

Finding the Limit with REVs – Multi-scale Modelling in Practice

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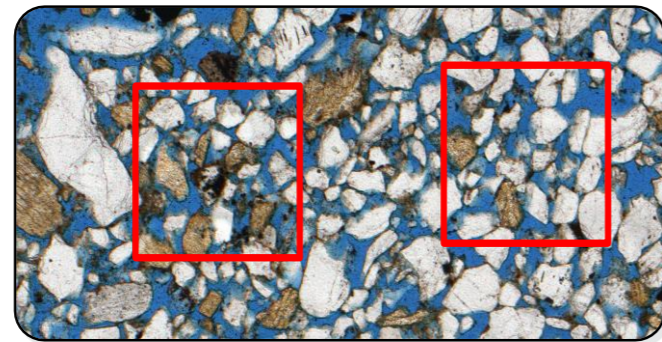
The idea revolves around the use of multi-scale modelling to capture small-scale detail in larger scale models without recourse to multi-million cell models.

To make it work, scales have to be identified at which a Representative Elementary Volume ('REV') can be defined. The REV's effectively capture the reservoir heterogeneity but to be valid they need to be a recurring feature in the reservoir.

Application at outcrop

The concept is applied to a well-studied Permian aeolian outcrop on the Moray Firth.

Grainflow and wind-ripple elements in the dune system approach an REV at different scales, and the two combine to generate a 'dune' REV at a much larger scale.



Micron-scale REV's



Grain flow (tabular) sands

Bed set REV's

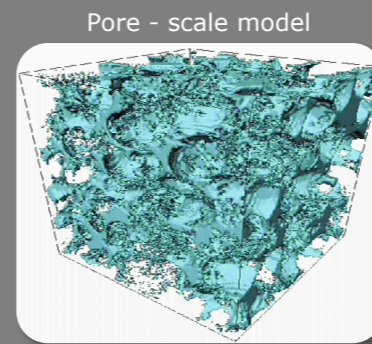


Wind-ripple (laminated) sands

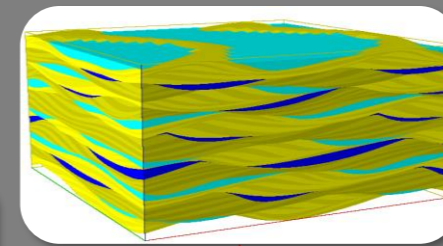
'Dune' – a mixture of wind-ripple and grain flow sands



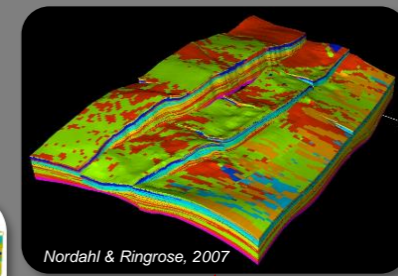
Genetic element REV's



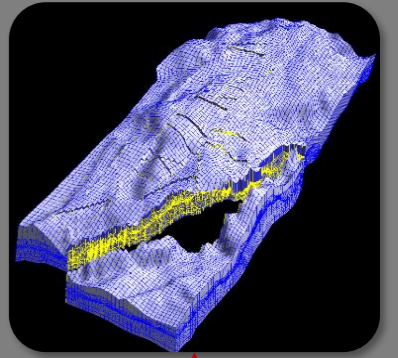
Pore - scale model



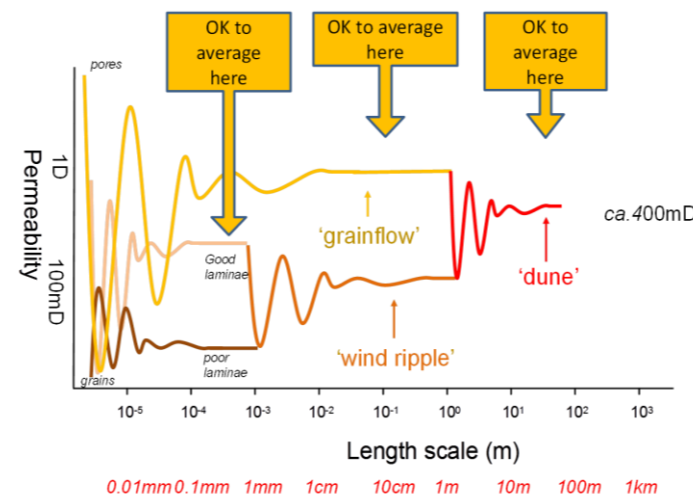
Lithofacies model



Reservoir geomodel



Reservoir simulation grid

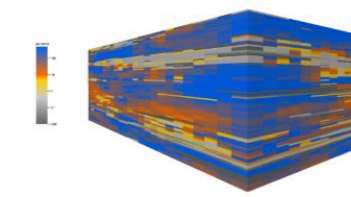


It is reasonable to calculate effective properties at an REV scale, on the basis that the REV's capture repeating heterogeneities. Works well in aeolian systems

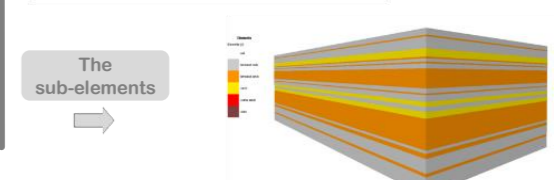
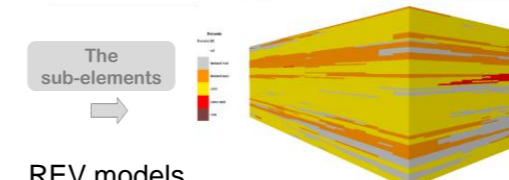
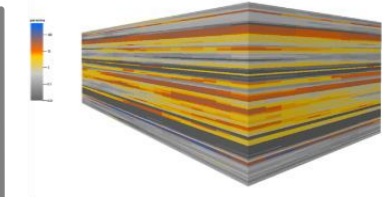
REV models for calculating effective properties

Static Models

Blocky Sands



Heterolithics



REV models, 240 x 60 x 3m, cell size 10 x 10m x 0.1ft

Dynamic Models

Tuning rel perms to match performance of the REV and fine-scale models

