Comparing Standard and Physical Upscaling:

Well Logs and Seismic

1. Field Data (Macro scale)

- Physical properties maps
- The authors would like to acknowledge the support of the DOE ENSP/NERA Autoscan II.

2. Unconsolidated Sands and Soils

- The methodology described above for consolidated rocks can be equally applied to unconsolidated samples.

3. Methodology/Workflow

   - Build a Physical Model
   - Apply the Model in the Field
   - Construct a Database
   - Inputs

4. Problem Statement

   - Analyze of Interest
   - Numerical simulations are commonly made using simplified equivalent continua with appropriate physical properties at the macroscale while honoring meso-scale heterogeneities, both early flow "breakthrough" and significant anomalous non-Fickian dispersion are expected, compared to a simplified homogeneous equivalent.

5. Summary

   - The NE R A utoscan II methodology is now being used to collect permeability data on unconsolidated sands and soils.

6. Comparing Standard and Physical Upscaling: An Example using Borea Sandstone

   - Physical models using datamining software permit the detailed study of heterogeneity at those length scales most difficult to quantify using standard field and laboratory practices. The device permits the detailed study of heterogeneity at those length scales most difficult to quantify using standard field and laboratory practices.

   - Anisotropy increases rapidly from zero at full saturation to a maximum near 75% saturation.

   - Physically upscaled conductivity anisotropy is plotted as a function of saturation.

   - Details of the relative permeability curves can be understood by viewing the permeability maps as a function of saturation.

   - Unconsolidated Sands and Soils

   - Heterogeneities lead to significant anisotropy in the relative permeabilities for brine.

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