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Statistical Characterisation of Porous Media at the Pore Scale

Progress Report 4

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Report Outline

- **Current Status**
- **Next Steps**

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Current Status

- Extended number of samples for analysis:
  - Available Samples S1-S9, C1, C2 and Berea added
    - » Permeability in three directions pre-computed (Dong and Blunt)
- Covariance:
  - Computed Covariance for all samples
  - Code requires comparison to RGeostats ->Things to Do
  - Resulting Covariance indicates isotropic behavior in many samples whereas MT shows anisotropy or statistical variation
    - » Needs further investigation as to differentiate true anisotropy vs. statistical variation
- Parametric Models
  - Binary Voxel Images created from parametric models
    - » Allows computation of permeability and covariance for this set of samples
- Permeability:
  - Indication from samples S1-S9, C1, C2 and Berea that the magnitude of the components of the first Minkowski Tensor correlate negatively with the magnitude of the directional permeability.
  - Continued Literature review shows that first Minkowski Tensor is equivalent to the area tensor defined by (Wetzel and Tucker 1998)
    - » Has applications in describing the mixing behavior of two-phase systems
    - » Used in closure relations for two-phase flow systems (Morel 2007)
    - » Mathematical and physical community disconnected as equivalence between “area tensor” and “Minkowski Tensors” has not been established or defined
  - Access to Tesla3 now available:
    - » Computation of remaining permeability values for remaining samples and parametric models

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Next Steps

- Comparison of Covariance computed from RGeostats with current implementation
- Investigate link of parameters obtained from Covariance with Minkowski Tensor
- Investigation of literature on “area tensor” and it’s use in two-phase flow
- Write Up of Introduction/Literature Review
- Computation of permeability for rock samples and parametric models

- Next Meeting:
  - TBA
  - Professor Olivier Dubrule away July, August
  - Dr. Branko Bijeljic at Imperial in July