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STATISTICAL GEOMETRY

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Abstract:

Strongly correlated and complex random geometries abound in natural porous media. In fact, porous media are interface dominated materials exhibiting strongly correlated random geometries over many decades in length. The talk will give an overview of methods for geometric characterization and analysis of physical properties for random geometries as they occur in natural porous media [1,2].

Recently, stochastic multiscale media have attracted considerable interest. A method to generate stochastic morphologies for multiscale media was introduced and applied to carbonates [3,4]. The method is particularly suited for modeling carbonate rocks occurring in petroleum reservoirs that exhibit porosity and grain structure covering several decades in length scales [5]. The mathematical model reproduces correlations with primordial depositional textures, scale dependent intergranular porosity over several decades, vuggy porosity, a percolating pore space, a percolating matrix space, and strong resolution dependence of both physical and morphological descriptors such as permeability or Minkowski functionals. The continuum based model allows discretization at arbitrary resolution and provides synthetic micro-CT images for resolution dependent simulations, morphological analysis or tests of multiscale models and methods. It has recently been used to provide free access to the worldwide largest threedimensional fully threedimensional calibrated porous microstructures [6].

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