Visualization Techniques in the Analysis of Bioturbate Textures

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Recent research has shown that permeability fabrics related to bioturbate textures can influence reservoir quality. This paper discusses new methods used for imaging and characterizing permeability fabrics at the core scale. Methodological approaches towards the quantification of porosity and permeability are also discussed. In particular, two case studies are introduced:

(1) Magnetic resonance images are paired with petrographic data to evaluate the textural characteristics of rocks dominated by *Macaronichnus segregatis*, a trace fossil that is commonly associated with rocks deposited in shallow, marginal marine sedimentary environments. MRI techniques used revealed the 3-dimensional geometry of the trace fossil. Burrows are typically horizontal and in plan view range between straight, sinuous, meandering, and spiral geometries. The pairing of MRI and petrographic data help map the distribution of porosity in the burrowed rock.

(2) Magnetic resonance images are analyzed in conjunction with petrographic data to evaluate the textural characteristics of rocks dominated by texturally selective dolomitization. The MRI measurements reveal the 3-dimensional geometry of the physical sedimentary structures and the trace fossils that influenced dolomitization and porosity development. Notable results include: 1) the successful resolution of the porosity distribution in a rock characterized by a low overall porosity (generally less than 6%); 2) imaging of complex distribution of porosity in a typical Palliser Fm. carbonate rock; 3) the successful acquisition of the 3-dimensional data required to model the porous network; and, 4) recognition that the complex distribution of porosity and its relationship to the matrix show that this fabric represents a dual porosity/permeability system.