Contribution ID: **843** Type: **Poster**

Digital Rocks Portal: Curation, Visualization and Analysis of Imaged Porous Materials

Tuesday, 15 May 2018 17:15 (1h 30m)

The Digital Rocks (https://www.digitalrocksportal.org) is the first platform of its kind for data management of images of rock microstructure. It allows preservation, curation, visualization and basic analysis of images of porous materials (and experiments on them). Imaging modalities include X-ray (micro)tomography, (focused ion beam) scattered electron microscopy, optical microscopy, magnetic resonance imaging. We are not limited to imaged data, model media are welcome as well. Any accompanying measurements (porosity, capillary pressure, permeability, electrical, NMR and elastic properties, etc.) required for both validation on modeling approaches and the upscaling and building of larger (hydro)geological models can be associated with images. The portal is implemented within the reliable, 24/7 maintained High Performance Computing Infrastructure supported by the Texas Advanced Computing Center at the University of Texas at Austin.

We overview features of the portal. We create and easy-to-browse presentation of datasets and their interrelationships, which for 3D datasets includes a movie through the slices, and basic image statistics. We collect information from the user that makes is possible to relate image to the physical sample and its petrophysical properties. Remote visualization through users'web-browsers is available on the parallel visualization cluster. All datasets are private (visible only to the author and collaborators) until ready for the public domain. We have a semi-automated publishing pipeline that provides digital object identifiers for cross-referencing in other publications. We continuously improve discoverability, most recently by implementing local search, adding rich snippets to the project metadata, as well as alternative metrics by Altmetrics. Further, we are an approved data repository for Geosciences Data Journal, and are registered in Registry of Research Data Repositories. We are part of EarthCube collaborative to enhance access to Geoscience data, models and resources (https://www.earthcube.org/). As such, we have developed an extensible data model that can be used for linking to other repositories and software.

We finally discuss what it takes to create a go-to benchmark repository for cross-validation and data-driven upscaling (including, but not limited to, machine learning techniques) of microstructure properties in subsurface engineering, material science and geosciences.

References

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Session Classification: Poster 2

Track Classification: MS 2.06: New Trends in Image Processing: From Discrete Tomography over Machine Learning to in-situ Contact Angle Measurement