A Core Competency: Digitalizing Core Data for Better Energy-Resource and Mineral Prediction

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Abstract

Core taken from boreholes is used to characterize many subsurface earth-resources, including hydrocarbon, mineral, and water extraction, geothermal energy development, carbon sequestration, hydrogen storage, and for geotechnical and paleoclimate characterization. Although these disciplines often have different objectives, many of the analyses performed on core are the same – however, there is little communication of sharing of best practices between disciplines. Furthermore, the storage of core and the associated analytical data is often haphazard and not in a digital framework. Given that core is expensive to collect and is the only data type that fully characterizes the heterogeneity in the complex rock types we study, it is imperative that the subsurface community develops a wide-ranging framework to store and analyze core data. Cross-disciplinary collaboration (e.g., between the mining and oil/gas sectors) will be crucial for economies of scale when scanning and digitalizing core data, ensuring future access to this irreplaceable resource that is not only used for resource characterization, but also for training the next generation of subsurface geoscientists.

This talk will provide an overview of the many tools available to help digitalize core, creating data that can be accessed anywhere for viewing, interpretation, and analysis. These tools are unlocking warehouses full of dusty core boxes, providing valuable high-resolution data that can be used for earth- resource characterization in a multitude of geological settings. Core scanners provide 3D lidar and/or CT scans of the core, high-resolution photography, quantitative geochemistry (using e.g., XRF, magnetic susceptibility, multi/hyperspectral imaging), and geomechanical properties. Plugs and thin sections from the core can be photographed for viewing in a ‘virtual microscope’ and scanned using automated mineralogy techniques to provide quantitative constraints on mineralogy, grain-size, ore-grade, and porosity. Other analytical data (e.g., core descriptions, four-acid assays, plug-based permeability) can be embedded in a depth-registered framework to be compared with scanned core data to allow for statistical comparisons and machine-learning enabled predictions of discipline-specific properties.

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