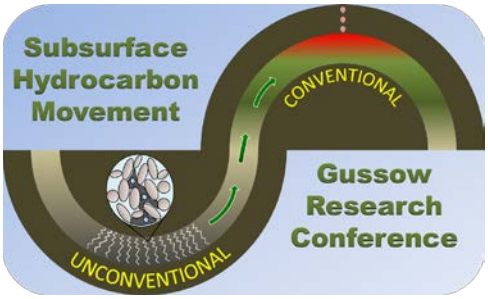

Multiscale Characterization of Spatial Heterogeneity of Petroleum Source Rocks via Optical and Near-Infrared Reflectance

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Summary

Simulation of natural petroleum generation and expulsion and in-situ oil shale retorting require characterization of the organic content of the source rock and corresponding values of mechanical properties, thermal conductivity, and permeability as a function or organic content and maturity. We have developed methods using standard optical core photographs (*Mehmani et al., 2016a*) and near-infrared reflectance core scans (*Mehmani et al., 2017*) to map the spatial distribution of organic content at the core scale with *O*(100µm) resolution. The latter method is more accurate and generally applicable due to less interference in some formations with high concentrations of dark-colored minerals such as iron-bearing clays and oxides. We apply the method to an immature oil shale core from the Green River Formation, USA, and show its capability in capturing millimetre and meter scale heterogeneity. We demonstrate the fractal-like variability of the organic matter concentration. We demonstrate the implications of this work for mapping spatial distributions of thermo-hydro-mechanical properties of petroleum source rocks at the core scale using thermal conductivity as an example (*Mehmani et al., 2016b*). Extensions to permeability and elastic modulus would be straightforward given currently established correlations and averaging methods.

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