An Integrated Methodology Quantifying the Links Between Rock Physics- and Geochemical- Properties in Organic-Rich Shales

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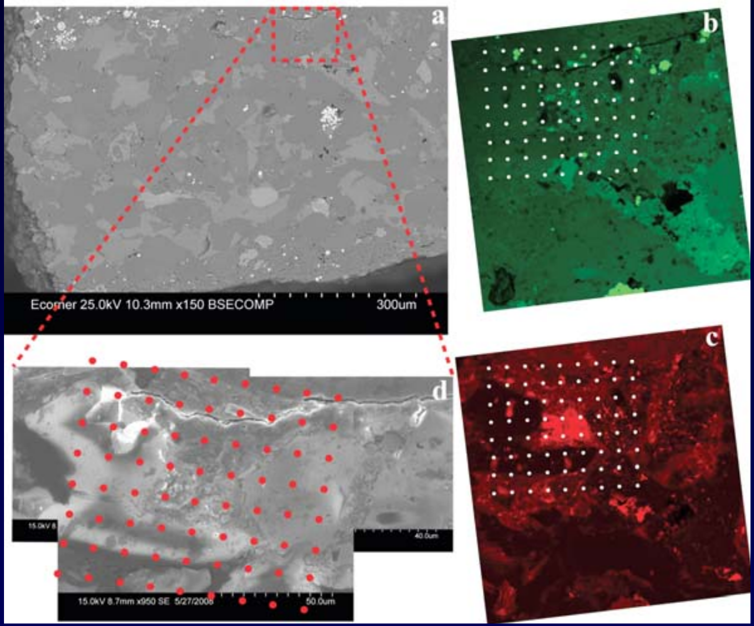
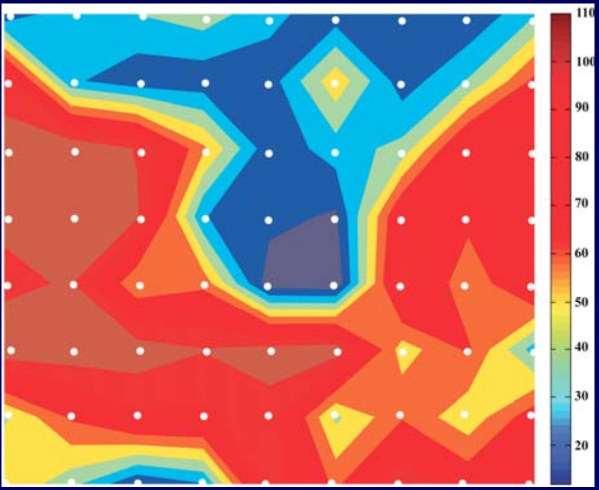
We addressed the problem of understanding the elastic properties of the organic matter in source rocks so that better prediction of seismic velocity can be made.

Our approach for elastic property estimation and mapping is based on the coupling of methods that are able to *visualize* and *identify* the organic matter within the rock and then *measure* its nanoscale elastic properties. We thus coupled nanoindentation and AFM methods with scanning electron microscopy (SEM) and confocal laser-scanning microscopy (CLSM). We performed nanoindentaion experiments on areas previously identified as kerogen via SEM and CLSM, and subsequently calculating Young's modulus from force-displacement curves obtained while probing.





Young's modulus map (left) and bulk modulus map (right) of the area of interest. Organic matter (dark blue) is characterized by low (10-15 GPa) values of Young's modulus as well as low (5-10 GPa) values of bulk modulus. The bar on the right is in GPa. Sampling area is 120 × 110 μm.