FRACTURE DETECTION AND PROPERTY ESTIMATION IN MICROCT IMAGES

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ABSTRACT

MicroCT imaging is an exciting field when used to image experiments on rocks. A more exciting approach is imaging experiments on rock samples repeatedly over time. This allows us to 'visually' inspect the samples as the experiment progresses. Considering hydraulic conductivity as a subject of interest, particularly understanding how fracturing a rock sample under a deformation regime affects its permeability, detecting and measuring fracture properties is fundamental.

To detect and measure fracture features from microCT images of a rock sample that is evolving requires a repeatable, semi-automatic workflow to produce consistent measurements of time variant images. Here we evaluate a Hessian filtering technique on 3D microCT images of synthetic images and microCT images of a rock sample. We find that the Hessian filtering is successful in enhancing and detecting fractures. In addition, this technique eliminates the beam hardening effect on microCT images of rock samples which increases the reliability of picking isosurface values use in compute fracture surface area.

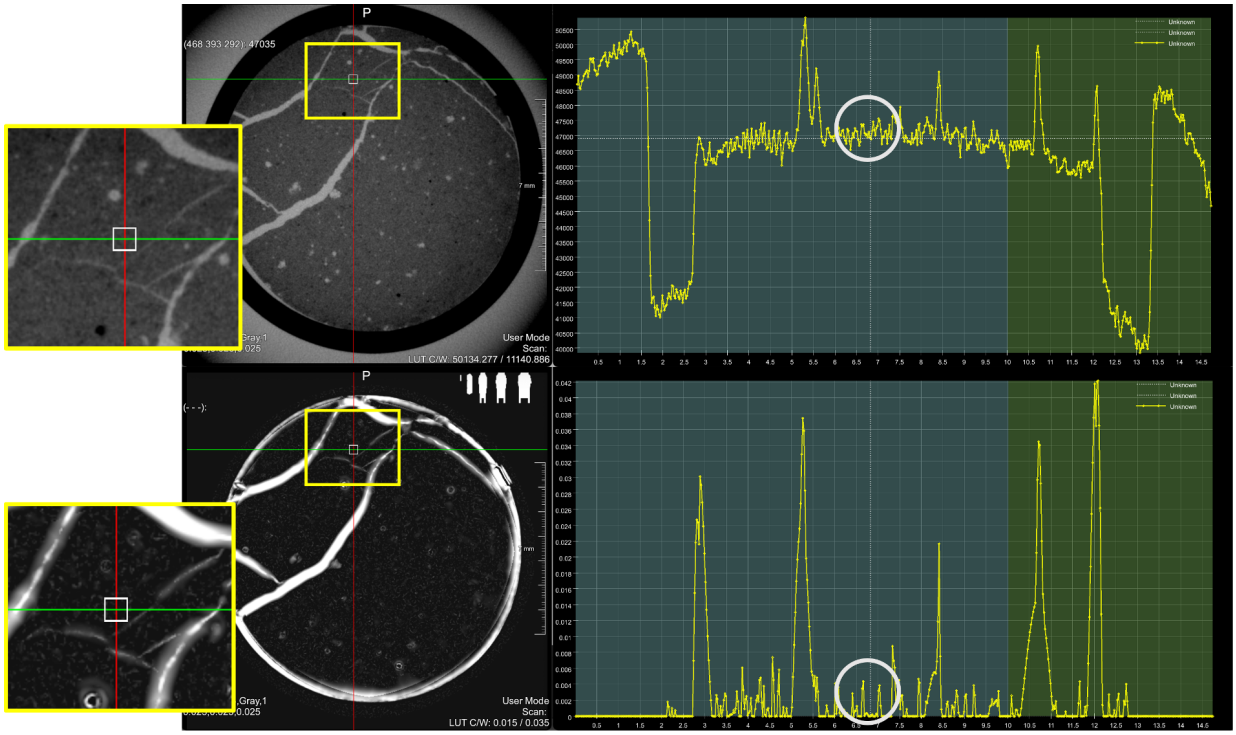

Figure 7. The top row show from left to right: a zoomed in version of the inverted microCT image 18_degree, a slice of the microCT image with two crossed green and red lines and a small while box showing the position of the cursor. The linear plot to the right show the gray values of the inverted microCT image along the green line shown on the microCT slice. Similarly, the bottom row is of the Hessian filtering enhanced image. Notice how much better small fractures show in the enhanced image in the slice image and in the linear plot inside the white circles.