thermoscientific

Fracture aperture computation

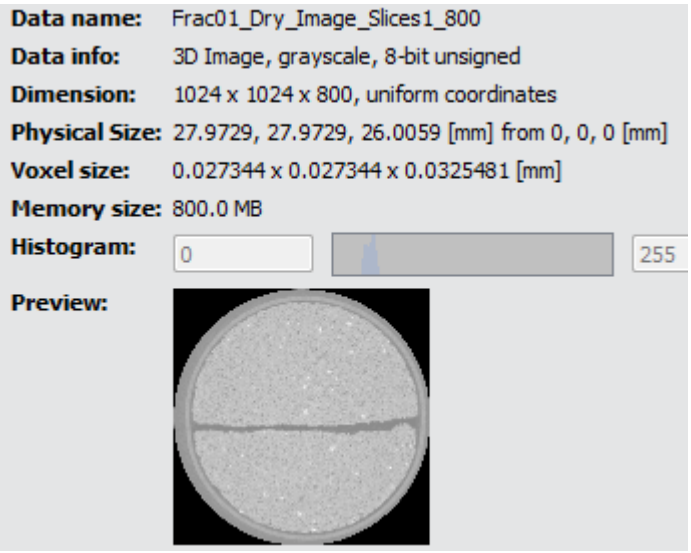
1. Introduction

This tutorial is part of the PerGeos Training course, and will detail how to compute the fracture aperture on a fractured sandstone sample.

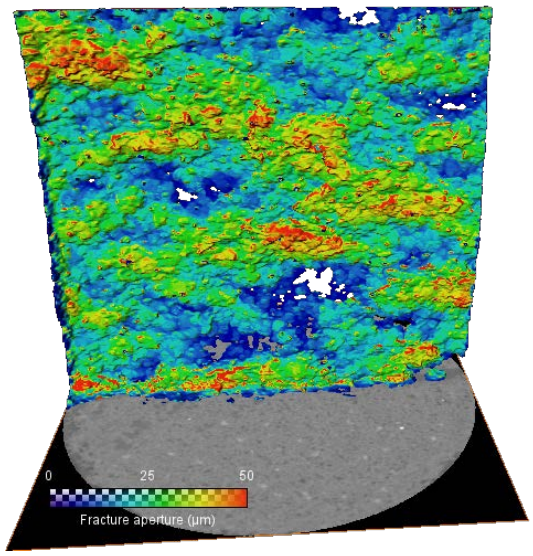
The data comes from the digital rock portal at https://www.digitalrocksportal.org/projects/31/origin_data/169/

As multiple data corresponding to different fractured steps are available, defining a recipe with the entire workflow (pre-processing, fracture segmentation, fracture aperture computation) will allow us to simply re-apply the recipe when changing the input data.

The fracture segmentation will be based on a Watershed transform, thus can be easily automated without any user interaction.



Fractured sandstone sample



Fracture aperture in 3D

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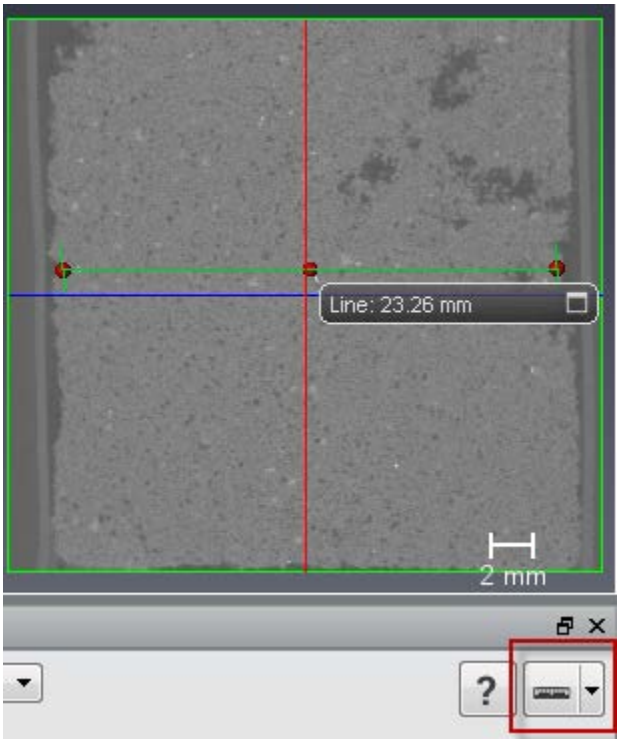
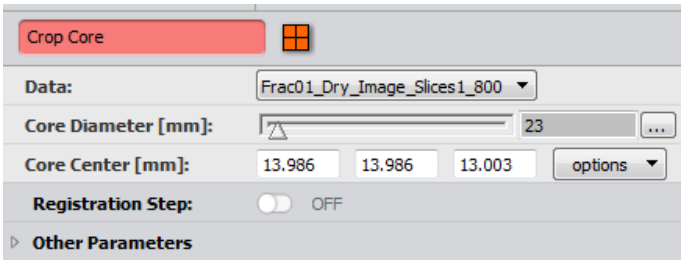
2. Data pre-processing

The pre-processing step will only consist on cropping the core with Crop Core, in order to remove the barrel.

After having measured the radius of the core with the length tool (23 mm) , apply the Crop Core module (without registration).



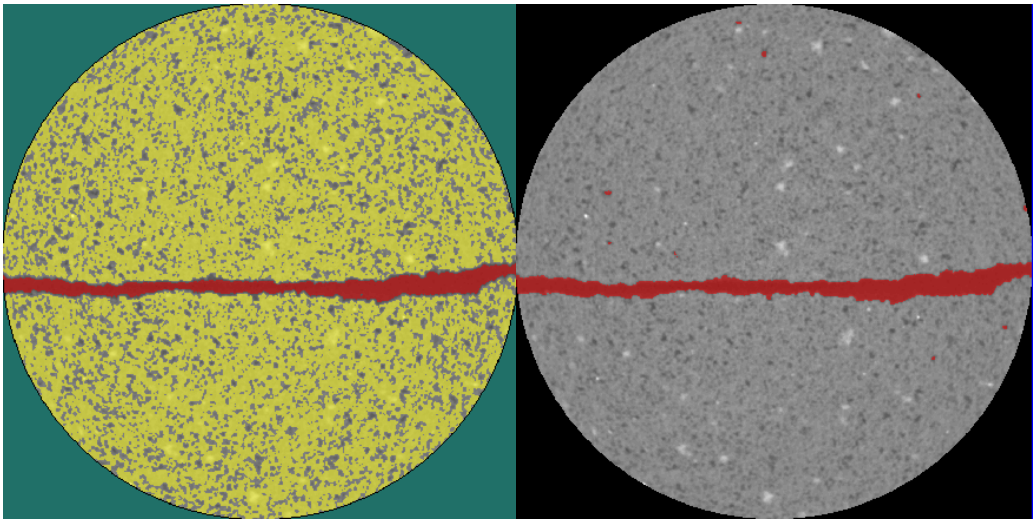
Core measurement



Crop core module

3. Fracture segmentation

The fracture will be segmented by a Watershed from thresholded markers.



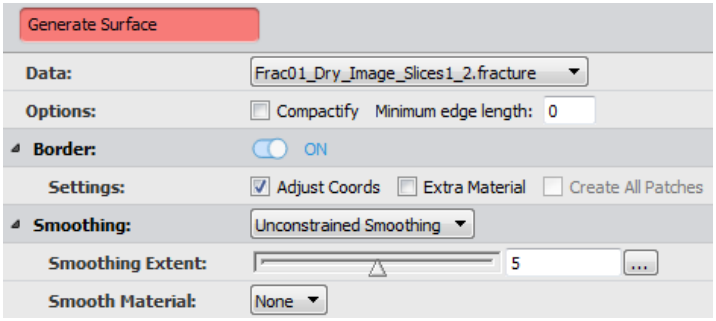
Watershed Markers ***Segmented fracture before filtering***

The segmentation will be enhanced by a *Label Analysis* / A*nalysis Filter* in order to remove eventual vugs or pores.

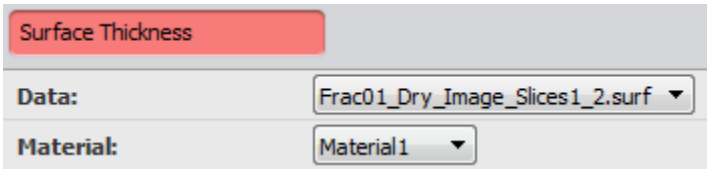
4. Fracture aperture computation

A 3D aperture map will be obtained after a surface mesh analysis.

Generate the fracture surface with *Generate Surface*, and compute the thickness for each point with *Surface thickness*.

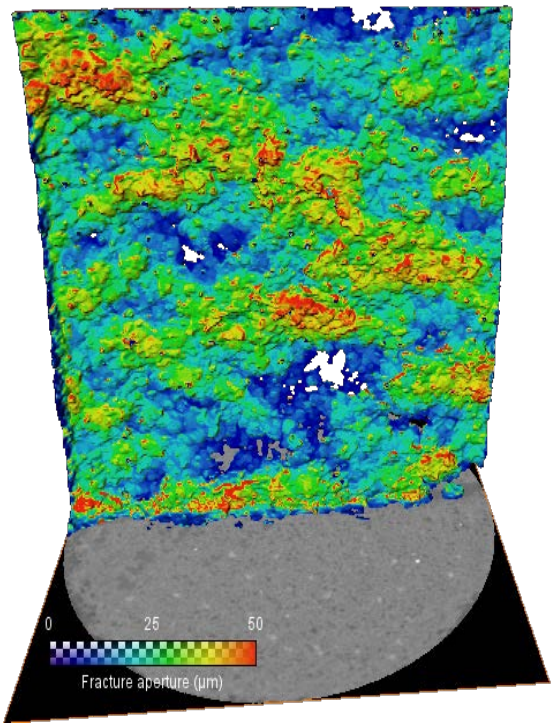


Generate surface module



Surface Thickness module

The thickness can be used as a scalar field for the surface display in the Explore workspace.

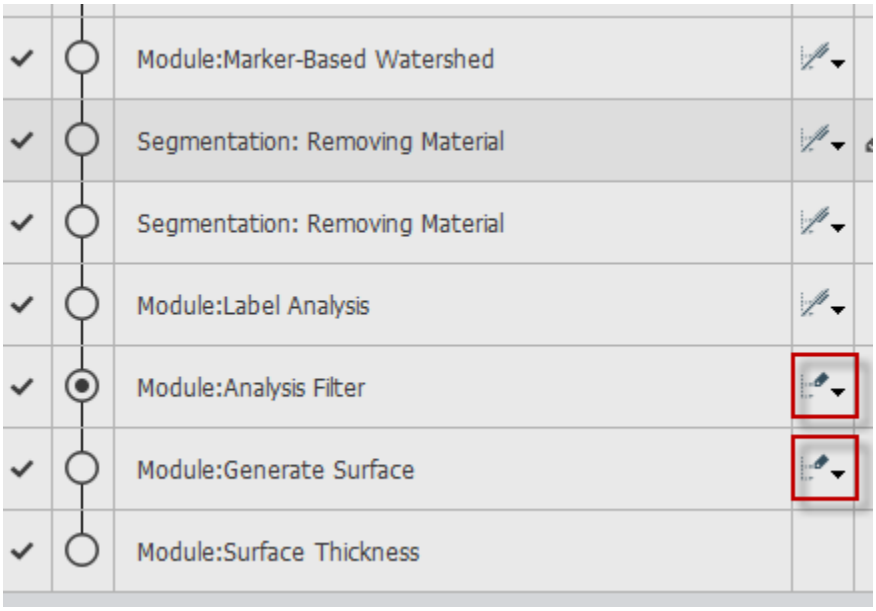


Visualization in the Explore workspace

5. Saving/Applying the recipe on the other data

Prior to saving the recipe, you can set multiple outputs to the recipe so that you can get:

- The cropped core
- The binary fracture 3D grid
- The surface mesh
- The thickness scalar field



Setting multiple outputs to the recipe

Applying the recipe on other data will directly generate the fracture thickness so that the fracture evolution can be analyzed.