

11.14: Mudrock Velocity Anisotropy Based on History of the Full Strain Tensor

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ABSTRACT

We show a workflow for the prediction of elastic stiffnesses from the full strain tensor. The result is a full stiffness tensor prediction for each element within a geomechanical model. The variation in values within the cross-section show the impact of deformation history on elastic stiffnesses. The resulting elastic stiffnesses are overpredicted compared to lab data due to the assumption of aligned inclusions.

The workflow to determine stiffnesses requires four steps. Step one is to describe the principal strain tensor for every element in the model from the outputs of a geomechanical model. Second, the principal strain tensor is used to describe porosity and aspect ratio with the assumption of incompressible grains. Third, properties for each constituent must be assigned. Fourth, each TI (transverse isotropic) elastic stiffness matrix is computed relative to the axis of symmetry. This workflow results in a cross-section populated with TI elastic properties for each element generated from a geomechanical model.

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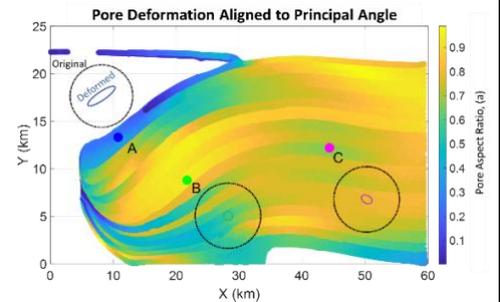


Fig. 1: Cross-section of pore aspect ratio in each element of the matrix. Specific points (A,B,C) are plotted on top of the figure to highlight the deformation of pore shape in each location relative to the original inclusion shape (dotted line).

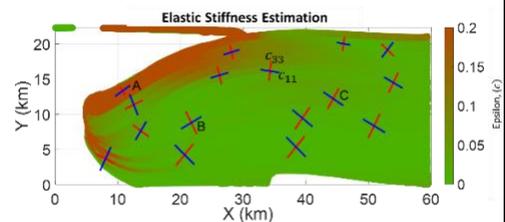


Fig. 2: Cross-section of epsilon (compressional anisotropy) values in each element of the matrix. Specific points are plotted with their maximum stiffness (C_{11}) and their minimum stiffness (C_{33}) oriented relative to their principal angle.

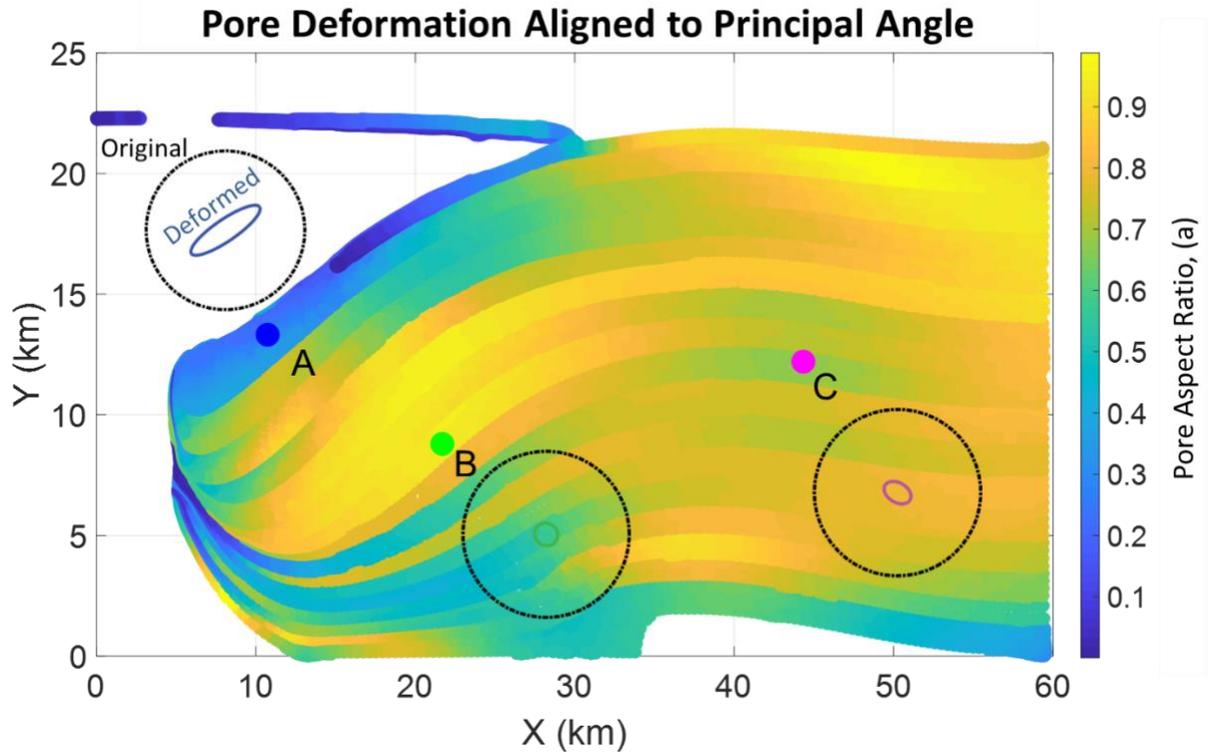


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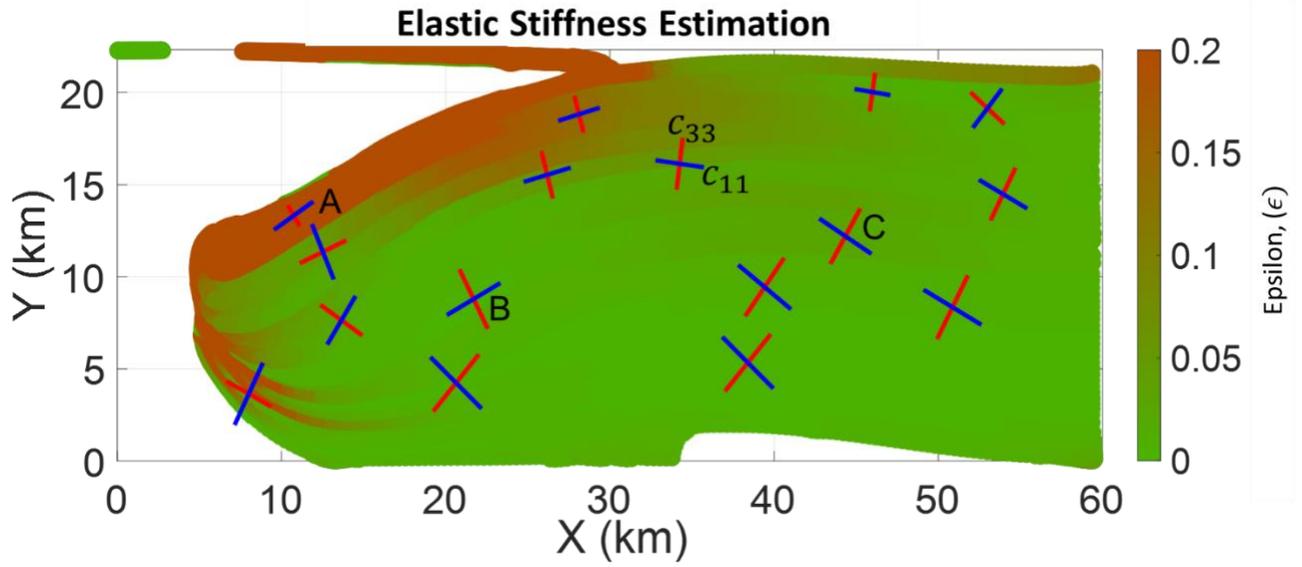


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