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Tomoview: Fast, low-memory-usage software for 3-d imaging and analysis

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This new software package has been purpose built for 3-d tomographic analysis of geomaterials. Its unique datafile structure allows the user to explore datasets of many gigabytes in size without loading times and using very little of the systems resources. This means that research groups can enjoy the benefits of 3-d tomographic analysis without investing in expensive high-end computer hardware. Sub-volumes can be selected from the dataset for advanced processing, rendering and characterisation. A broad range of data processing and morphology tools are available, allowing the user to remove noise and improve the overall image quality. It is possible to overlay and compare multiple datasets using interpolated slicing. As an example, this utility has been used to study the relative attenuation of neutron and X-ray computed tomography, highlighting the presence of water. Tomoview also features powerful and reliable segmentation algorithms to convert the dataset into a database of objects at the press of a button (isolating individual crystals, cracks and pores). These algorithms have been designed to cope with the subtle phase contrast, high image noise and artefacts often present in geomaterial tomography. The database gives each object a unique label and stores information such as its location; volume, mean-attenuation and bounding-box. It can be augmented using ellipsoid fitting to characterise the sizes, shapes and orientations of the objects. This allows us to quantitatively study subtle features such as particle anisotropy and flow dynamics. Complex structures, such as crack networks, cannot be well described by an ellipsoid. For these features, an algorithm has been developed to quantify the 3-d anisotropy based on the edge-gradient. This software package has already been applied to a number of geomaterial studies, several of which will be featured in this presentation.