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Synchrotron X-ray Tomography as Input for Multiphase Flow Modeling*

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We have been using the tomographic capabilities of beamline 8.3.2 of the Advanced Light Source at Lawrence Berkeley National Lab to image a variety of geologic materials. Beamline 8.3.2 is a dedicated X-tomorgraphy beamline with a superbend magnet source that provides a monochromatic beam in the 5 to 60 keV range and a spatial resolution of ~2 microns. (http://www-esg.lbl.gov/Beamline%20&%20Scientific%20Projects/BL832/3-Link/bl832.htm). Data provided by the beamline are processed and segmented in order to provide input for a variety of multiphase flow modeling applications. Example applications include understanding the displacement of brine by supercritical CO_2 in Frio sandstone and movement of natural gas within a low-permeability tight-sand gas reservoir. The CO2 investigation combined the micro-tomography images with a novel computational approach of Maximum Inscribed Spheres (MIS) in order analyze the pore geometry and connectivity within the Frio sand stone. The combination of the micro-tomography and MIS calculation allowed for the simulation of CO_2 movement under a variety of injection scenarios. The tight-sand gas reservoir simulation used a similar approach to understand the link between pore space geometry and flow in such conventional reservoirs.

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